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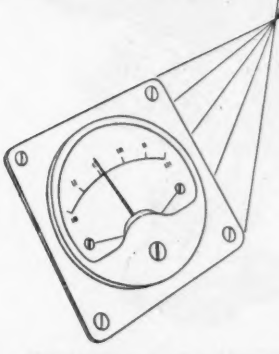

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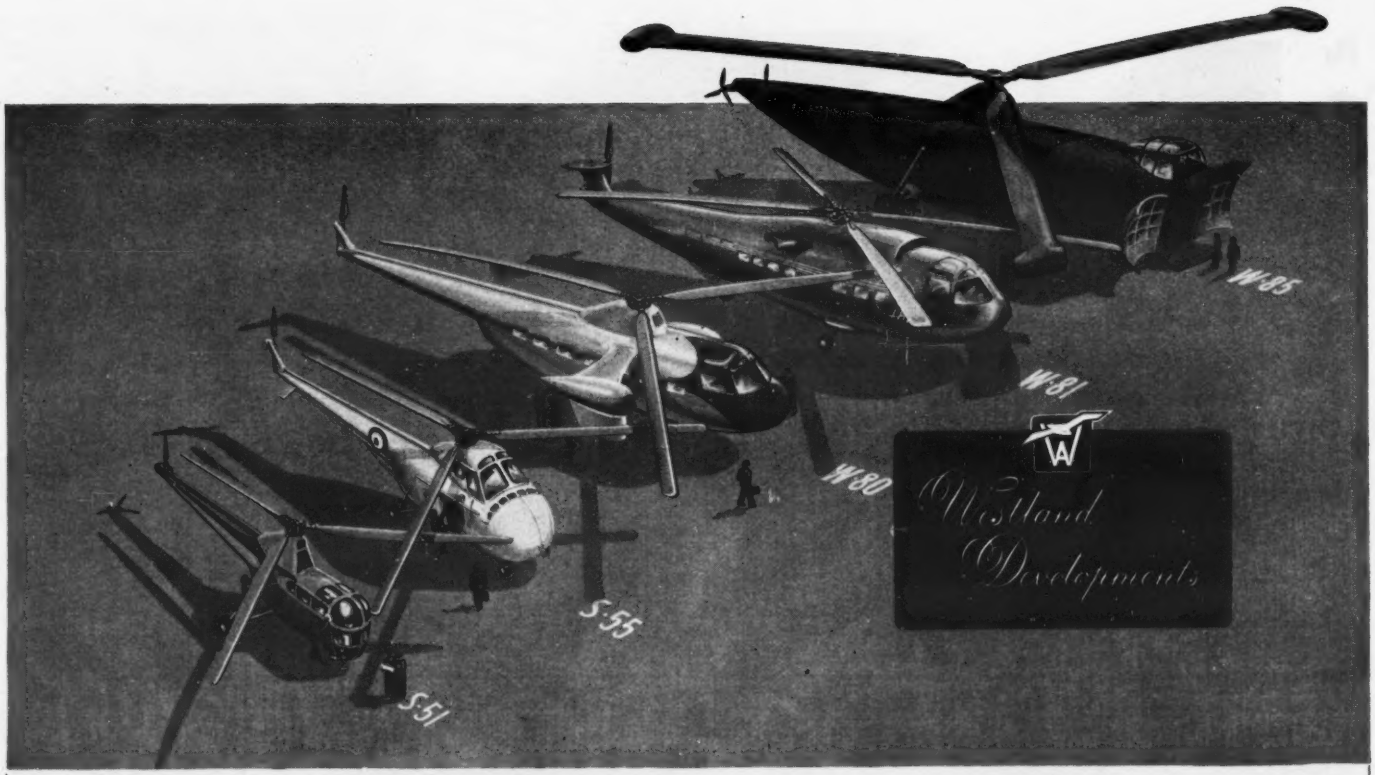

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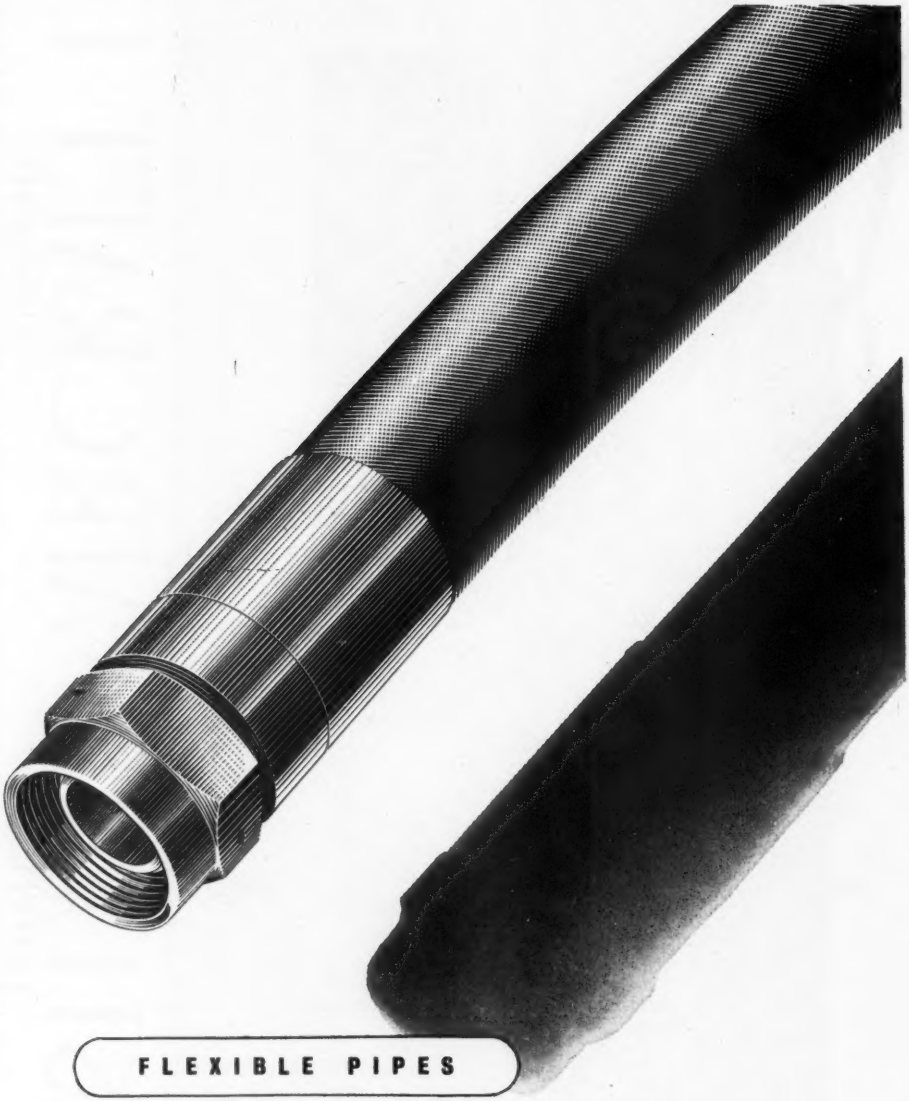

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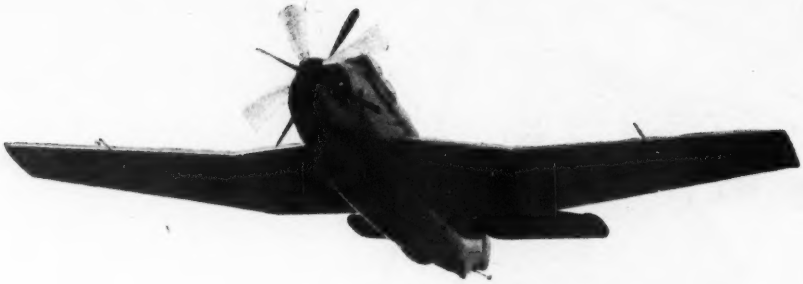
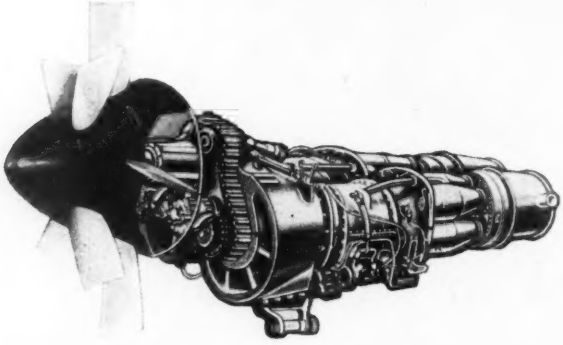


'SINGLE DRAG'

The design benefits of a single engine formula



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Fire-Power

OVER the years this journal has made a particular point of keeping track of air-armament development, in the knowledge that a fighting aircraft is only as good as its weapons. Whenever it has seemed timely we have drawn attention to shortcomings and failures in this regard and, when we have considered it to be merited, have accorded recognition to new developments.

Thus, in late years we have expressed concern that over-long retention of the 4 × 20 mm-gun formula for our fighters might bring about a situation similar to that obtaining after the Kaiser's War, when air armament was completely outstripped by airframe and engine design. On the other hand, we have occasionally (but, be it said, all too rarely) been able to applaud British innovations, notably the eight-gun Hurricane/Spitfire formula, though even at the time of that particular departure it was evident that this "whiplash" solution could not endure in face of armour. Now, with very advanced types of fighters in production or under development for the R.A.F. and Naval Aviation, attention is again directed to the all-important weapons with which these machines must be provided.

The successes of U.S.A.F. Sabres (six 0.5in guns) against the heavy-cannon-armed Mig-15s over Korea are not, it seems, attributable to any superiority in weapons or aircraft performance, but to the excellence of the American gun-sight and to the very high standard of pilot-training. Lately resuscitated arguments between protagonists of the "six 50s" formula and those who—like the R.A.F. and the U.S. Navy—have favoured an armament of four 20 mm guns, are, therefore, only of academic interest. What the protagonists too frequently forget is that the Mig, like other fighters of its class, is a relatively easy proposition for existing guns—assuming, of course, that these weapons can be brought to bear. Britain's new intercepters, we would remind them, are not primarily intended to "dog fight" with their opposite numbers but to knock large, well-protected bombers clean out of the sky before these can attain their targets. Pending the introduction of air-to-air guided missiles, therefore, we must look (as did the Germans, towards the end of the war) to guns of heavier calibre than ½in and 20 mm. It would be disappointing, in fact, if, in terms of destructive power, Britain's new fighters did not prove to be as great an advance on the Meteor and Vampire as were the Hurricane and Spitfire on the Gladiator.

In the absence of any official intimation of new fighter armament we can only remark that the four extra-large gun ports on the Supermarine 508 made one of the most reassuring sights at Farnborough.

The Aim In Europe

THE chief tactical problem facing the Allied powers in Europe can be stated very simply: it is to resist and contain any aggression. The only aggression which is foreseen as a possibility—if not, as some feel, a probability—is, of course, expected to come from over the ferrous wall and the territorial planning task facing the Allied powers is therefore clear-cut.

By far the greatest single element of the air problem is inter-Allied liaison and integration—larger, perhaps, than the matter of obtaining the best aircraft in the shortest time. In practical fact, the essential *raison d'être* of the recently concluded air exercises (their forerunners and, no doubt, those still to come) has been to refine the whole machinery of Allied air power in Europe in order finally to achieve a fully integrated entity. To achieve, that is to say, a single air force composed of several national elements all of which are happily and efficiently submerged in a corporate whole.

The integration process has been steadily furthered during the past two or three years, and the results of the trials, irritations and distractions which plagued the earlier days are now beginning to appear as dividends. The system can today be regarded as having been firmly established: there remain the predominantly logistic problems of supply—not only of the most modern aircraft, but of the latest radar, guns, radio, rockets and all the myriad things without the support of which the finest flying machine is useless as a fighting medium.

"CIRRUS" and "PINNACLE"

Integrated Air Defence Exercises over the Continent and Great Britain

LAST Friday, September 28th, Exercise "Cirrus" got under way in Western Europe. It was purely an air exercise for the Allied air forces in Central Europe, but running concurrently for part of the time were French Army manœuvres in Germany ("Jupiter"), and an R.A.F. Fighter Command exercise in England ("Pinnacle").

Although having essentially the same primary purpose, "Cirrus" had more than twice the scope of its forerunner, "Ombrelle," held five months ago. More than a thousand aircraft from eight nations participated in "Cirrus," and although bad weather imposed delays and some reorganization of schedules, progress in the efficient integration of the several national air forces involved must necessarily have been furthered. What can now be said with some confidence is that the basic system of air defence for Western Europe as a whole is established—it is essentially the same as that evolved and used by Great Britain—and that the chief problems of the immediate future are concerned with the quality and quantity of equipment and bases rather than the method of their use.

It should not be thought for a moment that the air defence system of Western Europe is as yet a smoothly working machine—it is not: but the design is good, and the machine does work. It is simply a matter of practice making perfect, and exercises are the best way of obtaining practice.

On the opening day of "Cirrus," low cloud, descending at times virtually to fog, meant that many of the attacks scheduled for the morning had to be cancelled. Nevertheless, the operations in connection with "Jupiter" went comparatively well. On Saturday, bad weather in the early morning again clamped down on every defending airfield except two, and the exercise was therefore extended by a couple of hours. Early in the afternoon a mass raid of R.A.F. Washingtons and Lincolns, together with U.S.A.F. B-29s, comprising in all 125 aircraft, struck at Paris, whilst medium raids were directed against Brussels, Charleroi, Antwerp, Augsburg, Karlsruhe and Le Havre.

On Sunday, 120 R.A.F. and U.S.A.F. bombers converged on Brussels, attacking from the east, south and south-west at between 20,000 and 30,000ft. Two strikes were also made against Paris, and there were other raids on Rotterdam, Coblenz, Cologne, Antwerp, Hanover, Rouen, Kaiserslauten and Le Havre.

One of the more important aspects of "Cirrus" was the re-deployment of squadrons. On Saturday, an R.A.F. Meteor squadron moved bodily from Wahn, Germany, to Luxembourg, and a French squadron of Vampires moved from Coblenz, Germany, to Luxeil, France, whilst another Meteor squadron left Beauvechain, in Belgium, for a Dutch airfield, to be replaced by a French Meteor squadron. In all of these instances, local air lifts were employed for the total transfer.

Exercise "Pinnacle"

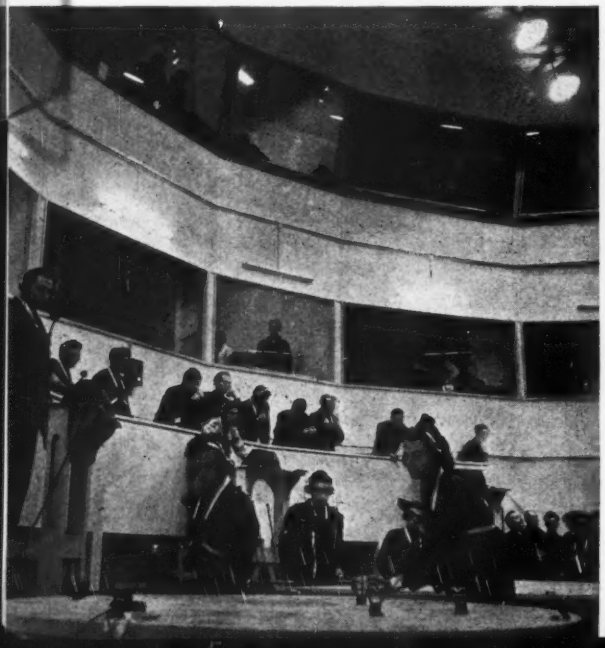
As "Cirrus" came to an end on the Continent "Pinnacle" carried on over Britain; in fact, for the first phases of "Pinnacle," the two exercises were integrated.

The schedules for "Pinnacle" have been so designed as to put to test the recommendations made after assessing the results of "Emperor," held in October, 1950 and "Foil," which took place in the summer of 1949. Thus this particular exercise is not a mere war game, with either Bomber Command or Fighter Command winning, but is a non-continuous test divided into six phases, in which Fighter Command is seeking the answers to certain specific problems.

Of these six phases no fewer than four are scheduled to take place during the week-ends in order that the utmost use can be made of Royal Auxiliary Air Force squadrons (all of which operate under Fighter Command) and the Royal Observer Corps. It will be remembered that the three-month call-up of the R.Aux.A.F. is now in its second period and, therefore, eleven of these squadrons are available for full-time operation during the exercise.

"Pinnacle" is chiefly remarkable for the fact that, for the first time, jet-propelled night fighters—Vampire N.F.10s and Meteor N.F.11s—are in operation. On the attacking side some Canberras and B-45s are in use but, as in previous exercises, the majority of attacks by high-speed, high-altitude jet

One of the five Sector Operations Centres in the air defence system of Western Europe: three French, one Belgian and one Dutch.



Air Chief Marshal Sir Hugh P. Lloyd, A.O.C.-in-C. Bomber Command, is here seen looking at a C-119 Fairchild Packet at Wiesbaden.

In the forest near Kaiserslauten the Central Tactical Air Force H.Q. and Joint Operations Centre were established under canvas.

bombers are simulated by jet and piston-engined fighters.

The attacking forces are being drawn from Bomber and Flying Training Command, 2nd T.A.F. (late B.A.F.O.), 7th Air Division U.S.A.F., 12th Air Force, U.S.A.F. and certain N.A.T.O. squadrons. Air Marshal Sir Basil Embry, as A.O.C.-in-C. Fighter Command, has at his disposal the R.A.F., R.C.A.F. and R.Aux.A.F. fighter squadrons; the U.S.A.F. Fighter Group equipped with F-86s which recently arrived in Britain; Regular and Territorial Anti-Aircraft Units; a Royal Naval night fighter squadron, flying Hornets; the Royal Auxiliary Fighter Control Units; and the R.O.C. For the exercise a number of R.A.F.V.R. officers on the Supplementary List have volunteered for training.

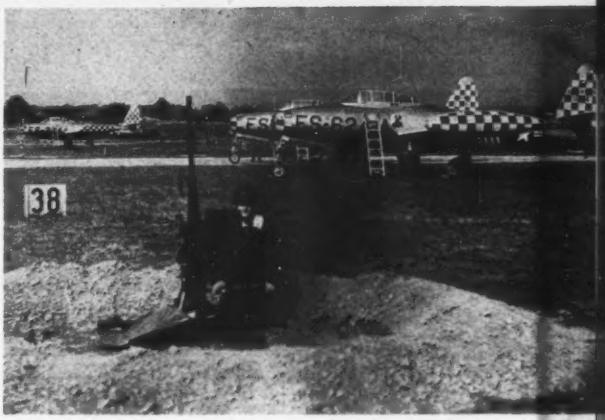
In near-perfect autumn weather the first phase opened at 1300 hr last Saturday. Within an hour three squadrons of Vampires, including No. 421 of the Royal Canadian Air Force, were scrambled from Odiham. Taking off in staggered pairs, the Vampires presented an inspiring spectacle in the brilliant sunshine, the high-pitched whistle of the Goblins adding not a little to the excitement.

Disappearing to the south-west, these fighters found and attacked a raiding force of over 80 aircraft, composed of B-29s, B-50s and Lincolns. The Boeings had forsaken their mutual protection formation and were, like the Lincolns, spread out in a deep "curtain," each about five miles from its nearest neighbour and at heights from 20,000ft to 27,000ft.

Interception was made on a line between the Isle of Wight and the Cherbourg peninsula. The B-29s and 50s were sited above the Lincolns and the fighter pilots were much exercised in their mind as to which were the most inviting targets—the Boeings with bigger crews and no inter-covering fire, or the Lincolns, which carried the greater bomb load. The Vampires attacked at a Mach number of 0.79 (545 m.p.h. at 27,000ft).

If the take-off was exciting to watch, then the landing provided additional excitement. Coming in off "break-up" turns to port, the Vampires touched down one every eight or nine seconds—at one time there were as many as eight aircraft on the runway together. One of the Canadians burst a tyre but escaped serious damage, and two of the pilots touched down on the grass lead-in to the runway in their endeavour to pull-off "short stoppers."

Immediately on landing the pilots taxied to the dispersal



Chequer-board decoration on these U.S.A.F. Thunderjets, and the emplacement in the foreground, point the international chess game.

This Canberra, seen at Wiesbaden, was serving as a personal high-speed transport for the A.O.C.-in-C., Bomber Command. Apart from Vampires belonging to the Italian Air Force, the Canberra was the only British aircraft to be seen on the field.

"CIRRUS" and "PINNACLE" . . .

points where, in a matter of minutes, W.R.A.F. and R.A.F. mechanics had refuelled and re-armed the Vampires ready for them to be called to readiness once more. There was no very long wait, for almost straightaway the regular R.A.F. squadron which had landed first was away again to try conclusions with four raids of six plus, again coming in from the direction of the Isle of Wight; in an exceedingly short time this air battle was going on directly over Odiham.

As we left the airfield word came over the Tannoy that the Tangmere squadrons had been scrambled to intercept yet another raid coming in from the direction of Cherbourg.

"Pinnacle's" Opening Phases

In the opening phases activity waxed and waned. The major targets were London, Bristol, Birmingham and Glasgow, and the exercise opened with an attack by Mosquitoes and Hornets, flying at about 20,000ft, on London. Washingtons and Lincolns approached the south coast from Le Havre, striking first at Bristol and then at Birmingham. These two main assaults were so timed that London and Bristol were simultaneously under attack, and while ground and air defences in the south were fully occupied with these threats a third blow fell in the north: Washingtons and B-50s flew up the Firth of Forth and crossed the coast on a wide front between Aberdeen and Edinburgh to strike at Glasgow.

There were several diversionary attacks by smaller units, but all raids, large and small, were intercepted before they reached the coast, and again—in increased strength—before attaining their targets.

Thick fog in the morning delayed the start of operations on the second day (September 30th). Washingtons and Lincolns made a rendezvous over the Friesian Islands for a raid on London and there was a series of running fights as the bombers made their way inland. B-29s and B-50s struck at Liverpool and there were various diversionary raids.

At Kaiserslautern and Wiesbaden

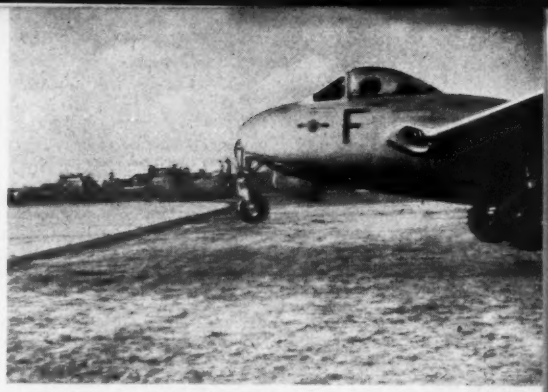
So far as "Cirrus" was concerned, the most interesting personal visits we were enabled to make were to Central Tactical Air Force H.Q., and to the airfield at Wiesbaden. On Saturday we watched dawn breaking at Orly whilst weather reports were bandied about, then flew somewhat uncomfortably in a C-119 Packet to Kaiserslautern. After landing on one of the great new runways which are now being built in various parts of western Germany, we trundled by bus along the autobahn for some miles until we came to a barrier closing off the twin-tracked highway: Stinson L-5s could be seen parked under the trees.

We turned off and bumped along a dirt road through the forest for about a mile until we came to a village of camouflaged tents; this was Central T.A.F. H.Q. After being briefed in English and French on the method of operation of a Tactical Air Force, we went into the Joint Operations Centre. Housed in a tent so big as to warrant being called a marquee, here were the "air" and "land" control rooms, with U.S. and French air force personnel sharing the work. The smooth efficiency of at least this bi-national organization was reassuringly impressive. It was not so reassuring, however, to be told, rather complacently, that the H.Q. could pack up and move in 48 hours: modern war is, certainly, a very complicated business, but 48 hours is a long time by classic tactical air force standards.

A rough ride in a jeep from H.Q. to the autobahn took us to the L-5s. These belonged to the 7030th H.Q. Support Group, U.S.A.F., and a highly efficient and self-contained unit it appeared to be. There were seven Stinson L-5s plus an interloping U.S. Army Cessna L-19 parked alongside the road under the trees, whilst a badly-bent Fieseler Storch belonging to the French Air Force lay on the opposite side of the road, where it had been crashed the previous day. The aircraft were complemented by a six-wheeled truck for carrying equipment; a jeep and a petrol tanker, and these, together with the mess tent-cum-office, amid the trees, comprised the unit.

On Sunday, when we left Orly in our Packet, it was at least daylight, and we had a comparatively comfortable trip to Wiesbaden. Unfortunately, however, we were able to spend only a limited amount of time there. The first thing we saw when alighting was the slim, feral shape of a Canberra; the dark and handsome stranger was not, however, participating in the exercise—beyond, that is, acting as the personal transport for Air Chief Marshal Sir Hugh P. Lloyd, A.O.C.-in-C. Bomber Command. Sir Hugh told us that the Chief of the Air Staff had come over to Wiesbaden earlier on and had conferred with the Chief of Staff of the Italian Air Force, General Urbani.

At Wiesbaden we drove past parks of Dakotas, C-54s, B-17s, B-26s, F-84s and a pair of T-33s with, for good measure, a single Grumman SA-16 amphibian, on our way to visit the Italian Vampire squadron which were fulfilling a fighter/bomber role in connection with exercise "Jupiter." The Italian Air Force has about 36 Vampire 5s, 16 of which, comprising No. 40 Squadron of the 6th "Gruppo Intersettori," were based at Wiesbaden under their commanding officer, Col. Paolo Moci. The squadron have had their Vampires only three or four weeks, but seemed, from what little we were able to see, completely happy and at home in them. Six or seven Italian pilots went some time ago to de Havillands so as to be able in turn to instruct their colleagues: they would appear to have done their job well.

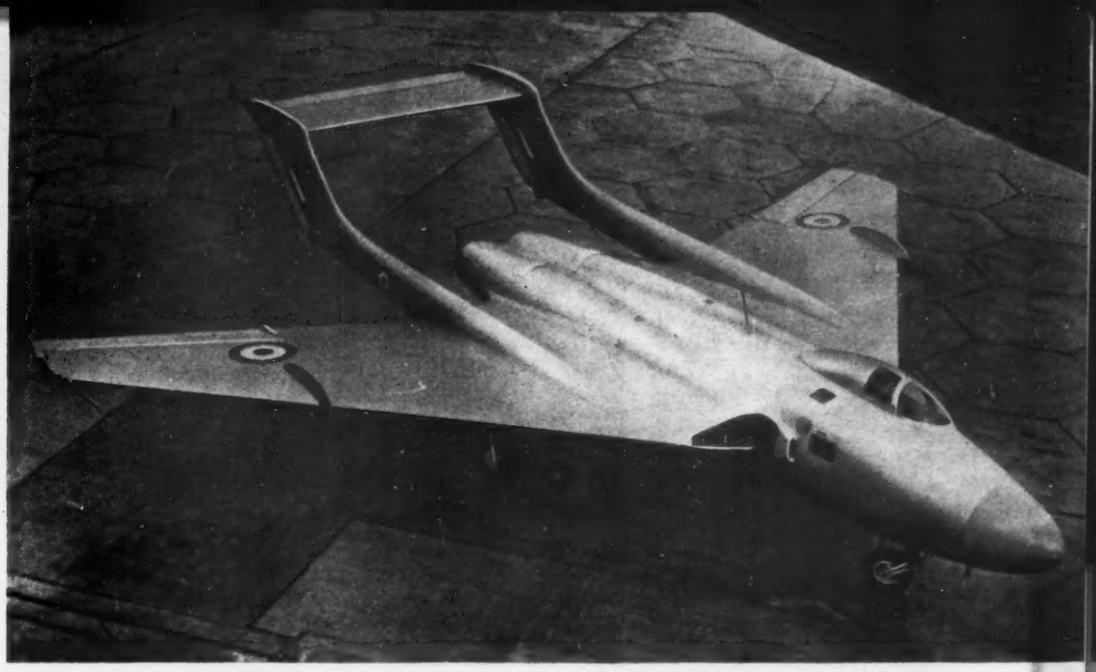


Top: An R.A.F. pilot makes his approach at Odiham with the obvious intention of not wasting any of the runway. Above: Pilots of No. 421 (Red Indian) Squadron, R.C.A.F., writing their combat reports after making an interception over the Channel in the first phase of "Pinnacle."

A CRANFIELD DINNER

THE first annual dinner of the Cranfield Aeronautical Society was held at the College of Aeronautics, Cranfield, on Saturday, September 22nd. Lt. Cdr. (E) A. J. Monk, R.N., presided, and fifty-seven former students of the College were present.

The two guests, Mr. Ernest F. Relf and Air Marshal Sir Victor Goddard, were unfortunately unable to attend, but were represented by Prof. R. L. Lickley, Deputy Principal of the College.



ALL WEATHER, ALL HOURS: Coincidentally bearing the same type number as the twin-engined Messerschmitt which set the style for fast, heavily-armed "destroyers," the new D.H.110 now makes its bow. Planned for round-the-clock, all-weather fighting, it has two Rolls-Royce Avons and made its first flight—of 46 minutes—on September 26th. The pilot was John Cunningham; test observer, A. J. Fairbrother.

PRINCESS ELIZABETH'S CANADIAN TOUR

WHEN their Royal Highnesses Princess Elizabeth and the Duke of Edinburgh travel to Canada next Sunday, October 7th, they will fly in a B.O.A.C. Stratocruiser with Capt. O. P. Jones, O.B.E., the Corporation's senior pilot, in command. It had originally been arranged that they should sail in the Canadian Pacific liner *Empress of France* on September 25th, but the King's illness caused a postponement, and the decision to travel by air.

The aircraft, which has been chartered from B.O.A.C. through the Ministry of Civil Aviation, is not likely to be modified to any considerable extent. The lower deck, normally a cocktail lounge, is being arranged as a private lounge for their Royal Highnesses.

Capt. O. P. Jones

Under Capt. Jones' command will be a crew of 11, with Capt. A. Hughes as second captain and Capt. G. Slocombe as 1st Officer; the others are Nav/Off. H. A. Doughton, R/Off. E. L. W. Hagger, Eng/Offs. B. O. Draper and R. W. Holmes, Chief Steward E. Smith, 2nd Steward J. Jarvis, 3rd Steward R. Elbourne, and Stewardess Jean Gordon.

From Canada comes news about the C-5 of R.C.A.F. Transport Command which is to be at the disposal of the Royal visitors. Technically classed as a long-range crew trainer, this particular variant of the Canadian North Star was built about a year ago and has since been reserved as a V.I.P. aircraft; the British and Canadian Prime Ministers and the Governor-General, Viscount Alexander, have been among the many distinguished passengers it has carried.

The Royal passengers will travel in the after section, which is divided into two separate compartments, linked by the centrally located galley. They will occupy a lounge furnished with divans convertible into beds, and with easy chairs, writing tables, and an intercommunication telephone. There are also private washrooms in this section of the fuselage, and the entire suite is self-contained for complete privacy.

Walls and ceilings are covered in pale grey gaberdine and the floor carpeted in maroon. Curtains of the R.C.A.F. tartan, which is predominantly blue, hang at the windows, and the furniture is upholstered in a deeper blue. Built-in lamps, ashtrays, and magazine racks are found in the writing tables, and an octagonal fold-down table will be used for meals.

The forward section, which will be occupied by the *entourage*, consists of 24 foam-rubber-covered seats convertible into berths to accommodate 16.

No. 412 Squadron, R.C.A.F., provides the manning pool from which the crew will be drawn. The C-5's captain will be W/C. Bob Trickett, with S/L. S. Cowan and F/L. L. Hussey as co-pilots; F/L. R. Thornycroft is navigator.

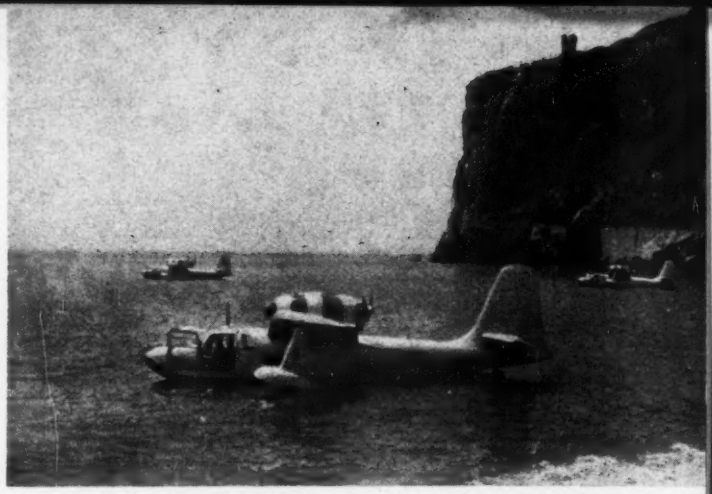
F. M. OWNER JOINS D.H.

FROM the de Havilland Enterprise comes news that Mr. F. M. Owner, C.B.E., M.Sc., M.I.Mech.E., F.R.Ae.S., joined the de Havilland Engine Co., Ltd., on October 1st as deputy chief engineer. He is immediately responsible to Dr. E. S. Moult, Ph.D., M.I.Mech.E., F.R.Ae.S., chief engineer of the company. Mr. J.L.P. Brodie, M.I.Mech.E., F.R.Ae.S., Hon. M.S.I.A.E., as is well known, is the director in charge of the engineering division, while Major F. B. Halford, C.B.E., F.R.Ae.S., this year's president of the Royal Aeronautical Society, is chairman of the board and technical director. Mr. Owner's office is at Stag Lane, Edgware, Middlesex, headquarters of the engineering division of the company.

Mr. F. M. Owner

Mr. Owner is one of the country's leading engine specialists, and in latter years has done a great deal of valuable work on gas turbines. He was engaged on engine design with the Bristol Aeroplane Co., Ltd., from 1922, and retired from that company in July this year after having held the position of chief engineer (engines) since 1947. He has been responsible for all the Bristol company's sleeve-valve design since 1934 and of turbine design and development since 1942. He is the author of a number of papers which in the post-war period have mainly concerned gas-turbine design and production.

HERE AND THERE



MEDITERRANEAN INTERLUDE: These neat little marine aircraft are Piaggio P-136 amphibian trainers of the Italian Air Force. They are seen lying off the Italian Riviera resort of Finale Ligure, and on top of the cliff is one of the ancient watch-towers that crown each headland on this coast.

More Sabres Here

TWENTY-FOUR F-86 Sabre jet fighters of the 81st Fighter Intercepter Wing, U.S.A.F., landed at R.A.F. Stations Shepherd's Grove and Bentwater, Suffolk, on September 26th. Of 50 which had left Keflavik, Iceland, on the first stage of the flight to Stornoway, 26 were obliged by weather to return. When these later arrived in England, the Sabre Wing, comprising the 91st, 92nd and 116th Squadrons, was complete.

Getting it Right

LORD VENTRY said last week that further trials of the Airship Club's little dirigible *Bournemouth* are soon to be made. Following the mishap at Cardington, when the airship was damaged through coming into contact with a roof, a new set of control surfaces is being fitted to give better fore-and-aft stability, and a larger airscrew is to be used on the 75 h.p. British Salmson engine.

The Great Yalu Battle

THE biggest air battle of the Korean campaign was fought over the Yalu River on September 26th between 77 Allied jet fighters (including Meteors flown by R.A.A.F. pilots) and about 120 Russian fighters. At least one e/a. is reported destroyed and four damaged. After the battle Col. Francis Gabreski, leader of the Sabres, remarked that the air war in Korea was becoming grimmer, and that the Communist aircraft and their pilots had distinctly improved. Whereas the Migs formerly remained on their airfields across the river when Allied formations appeared, they now came out to join combat.

The R.A.A.F. Meteors

IN Tokyo, on September 25th, Air Marshal Jones, the Australian Chief of Air Staff, denied that the Gloster Meteor 8 fighters used by the R.A.A.F. in Korea had been grounded. He remarked that these Meteors had three jobs—fighting, bomber escort and ground attack—and that it would be entirely premature at this stage to form an opinion as to whether or not they should be restricted to any one of these roles. He added that, while he recognized that the Mig-15 and the Sabre were faster than the Meteor, "We must fight with what we have."

South Bank Model Success

THE Society of Model Aeronautical Engineers has received from Sir Gerald Barry, the Festival's director-general, a letter of warm appreciation of the efforts of its members in giving model-flying demonstrations at the South Bank throughout the period of the Exhibition.

Comet Demonstration

LAST Friday saw the de Havilland Comet on loan to B.O.A.C., making its first two passenger demonstration flights. Among the 33 passengers on the first sortie, which lasted about 90 minutes, were the Minister of Civil Aviation, Lord Ogmore and Sir Arnold Overton, Permanent Under Secretary to the Ministry. Sir Frank Whittle and Air Chief Marshal Sir Frederick Bowhill, the M.C.A.'s Chief Aeronautical Adviser, flew on the second trip.

Music at the Ministry

AMONG distinguished members of the audience at the recent Festival Concert given by the Ariel Orchestra at the Ministry of Aviation were the Vice-Chief of the Air Staff, Air Chief Marshal Sir Ralph Cochrane, and the Permanent Under Secretary of the M.C.A., Sir Arnold Overton. An offshoot of the Ariel Club (Air Ministry and M.C.A. Social and Athletic Association) this orchestra is composed entirely of amateur musicians, both Service and civilian, among the staffs of the two Ministries.

Nylon-Shod

THE first aircraft tyres to be made in Canada with all-Canadian nylon fabric left the production moulds of the Toronto Dunlop subsidiary on September 7th for the wheels of the CF-100 fighter. Of 27in diameter, each tyre incorporates 4½ lb of nylon fabric.

Magic Badge

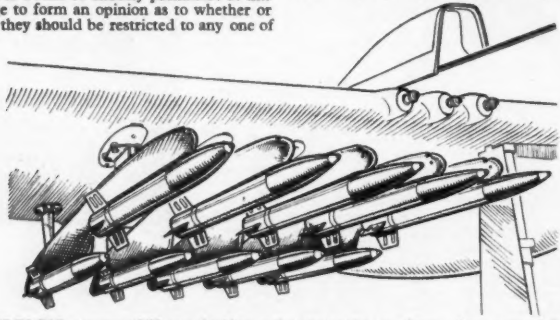
AFTER winning the recent 1,000-mile Grand Prix air race at Bari in his Ambrosini S.7 at 204.5 m.p.h., the Italian pilot G. Ferrari cabled the news to Nat Somers. Translated, the wire read: "Happy to advise you of my victory in the aerial 1,000 miles with the Ambrosini carrying the insignia of the Throttle Benders."

Official Confirmation

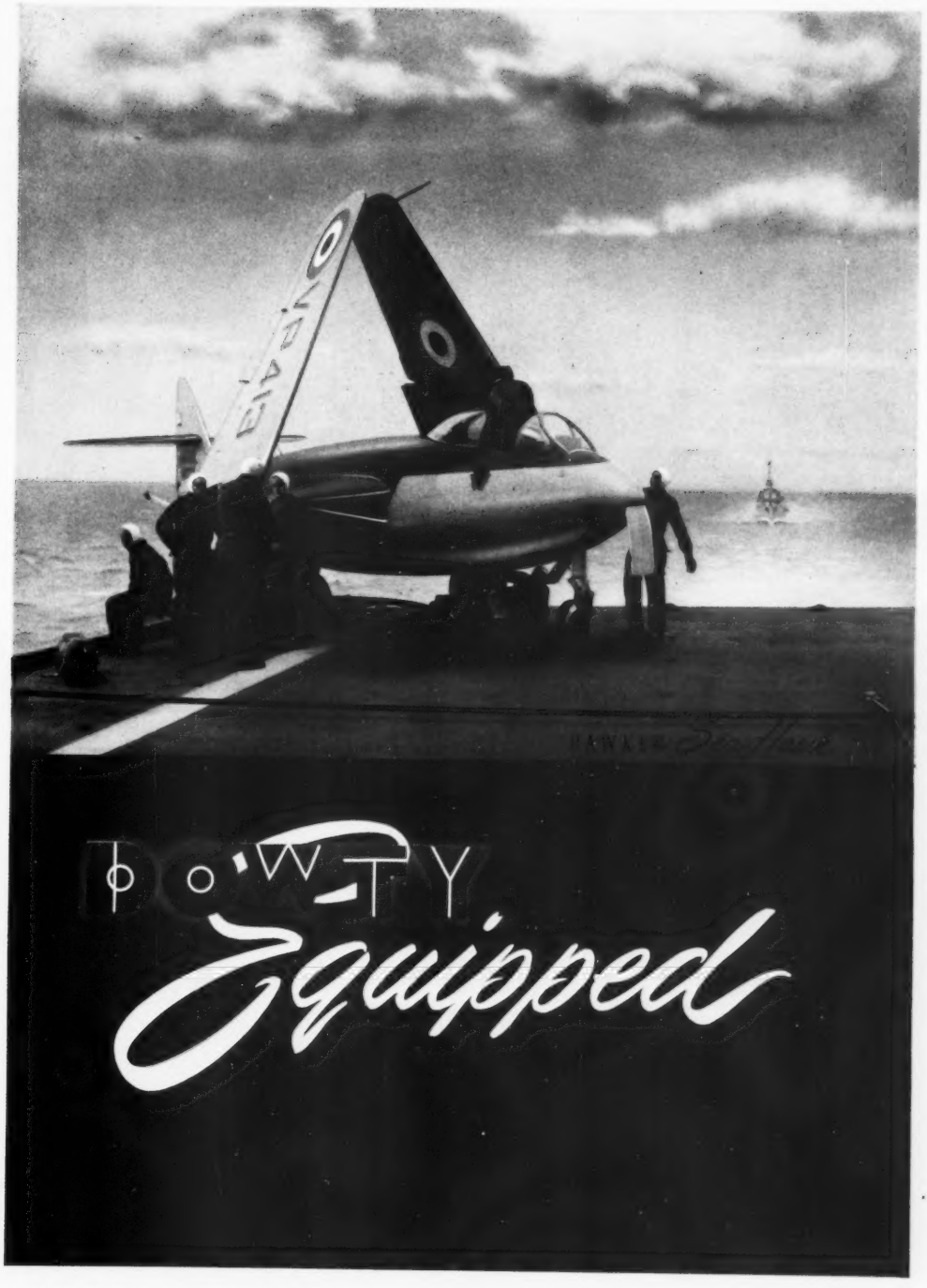
THE time for the Atlantic crossing by a Canberra B.2 on August 31st has been confirmed as a world record (point-to-point, Belfast to Gander) by the Fédération Aéronautique Internationale. W/C. R. P. Beamont, with D. A. Watson and R. H. T. Rylands as crew, covered the 2,071 statute miles in 4hr 18 min 24.4sec, an average speed of 774.255 km/hr (481 m.p.h.). Also confirmed are the four time-to-height records established at Moreton Valence on the same day by the Sapphire-Meteor. F/L. R. B. Prickett reached 3,000, 6,000, 9,000 and 12,000 metres from a standing start in 1 min 15.5 sec, 1 min 50 sec, 2 min 27 sec and 3 min 9.5 sec respectively.

The Ones That Got Away

THOSE who read our report, last week, of the *Daily Express* South Coast Race will recall a reference to the "breakwater-clipping" tactics adopted by some of the pilots at the Newhaven turn. It was also observed that the local anglers were probably the only people who were not amused. We have since learned of two complaints that may well be unique in air-racing history. An angler who had been fishing off



NOSE-TO-TAIL stowage of 80 mm Oerlikon rocket projectiles, as shown, allows twenty of these weapons to be carried by Swiss Air Force Mustangs. The armour-piercing head of this type of rocket has a shaped charge and will penetrate 10 inches of armour.



DOWTY EQUIPMENT LIMITED · CHELTENHAM

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The Viscount puts a new complexion on 'going by air'. longer are noise and vibration a passenger's inescapable companions — the Viscount was designed from start to finish to make the most of Turboprop smoothness.

VICKERS VISCOUNT

B.E.A., Discovery Class

FOUR ROLLS-ROYCE DART PROPELLER TURBINES

AT117

HERE AND THERE . . .

the Marina Esplanade, Ramsgate, wrote to the organizers saying that a blue monoplane came round the cliff and carried away his line, breaking the reel; and another, on Brighton Pier, protested that he had lost 70 yards of line through a similar cause. "Actually, of course," wrote the second sportsman, "it was the biggest thing I ever nearly caught, and gave me some small satisfaction."

Turboprop Contract

A RECENT announcement by Pratt and Whitney Aircraft says that the T-34 Turbo-Wasp is to be built by the Allis-Chalmers Manufacturing Co. This turboprop, which was designed for the U.S. Navy, has been chosen to power the new YC-124B transport aircraft of the Douglas Globemaster series—largest of its kind.

REMINISCENT—though of far less crude appearance—of the German V.1 of unmourned memory, a Martin Matador sits menacingly on its mobile launching cradle. Flying pictures of America's new pilotless bomber, a squadron of which is to be formed, appeared on page 386 of "Flight" for September 21st last.

IN BRIEF

THIS month sees the 50th birthday of the world's first radio college—established in 1901 by Marconi's Wireless Telegraph Co. Ltd.

* * *

As most observant readers will have realized, the Double-Mamba-engined aircraft illustrated on page 415 last week was the Blackburn and General Aircraft Y.B.1 and *not* the Fairey Gannet.

* * *

To finance a large volume of orders from British, Dominion and foreign governments, the R.F.D. Co., Ltd., has made application for the issue of £50,000 additional capital in 2s shares.

* * *

British Standards for unified-thread bolts, screws, nuts and washers (normal and heavy series, B.S. 1768 and 1769) have been issued by the British Standards Institution, 24/28, Victoria Street, London, S.W.1, at 3s and 2s 6d respectively.

The Northern Aluminium Co., Ltd., announces that as from October 1st the address of its head office and London area sales office is Bush House, Aldwych, London, W.C.2 (Temple Bar 8430).

* * *

The Aerauto Association is holding its annual dinner on October 13th, at Ye Olde Cock Tavern, Fleet Street, London, E.C.4. Details from G. Ford, College of Aeronautical and Automobile Engineering, Sydney Street, London, S.W.3.

* * *

Entitled *The Nimonic Alloys*, a new publication by Henry Wiggin and Co., Ltd., presents all the available information on this valuable series of materials, so largely used in turbine-blade manufacture.

* * *

On September 25th the reconstructed 22-acre lubricants plant of Shell-Mex and B.P., Ltd., was formally opened at Barton, Manchester, by Sir Frederick West, G.B.E. At each of four central control panels an operator can simultaneously make six different blends from a range of 50 basic oils or additives.

* * *

Mr. Noel Holman has taken up his duties as senior technical representative in Pakistan and is stationed in Karachi. He joined the company as an apprentice in 1934 and has specialized in engine installation problems.

* * *

Mr. J. Lester Pendleton, formerly sales manager of Field Aircraft Services, Ltd., has left in order to take over control, as director and manager, of Aeroservices (London), Ltd. (aircraft brokers and consultants, of 31, Clarges Street, London, W.1) and Aerotours (London), Ltd. Associated with these two companies is Aeroservices S.A.R.L., 36, Boulevard Haussman, Paris 9e. Field Aircraft Services, Ltd., inform us that for the time being their sales will be under the control of Mr. J. L. Smith, managing director.

Mr. J. Lester Pendleton, whose new position is referred to in the accompanying paragraph.

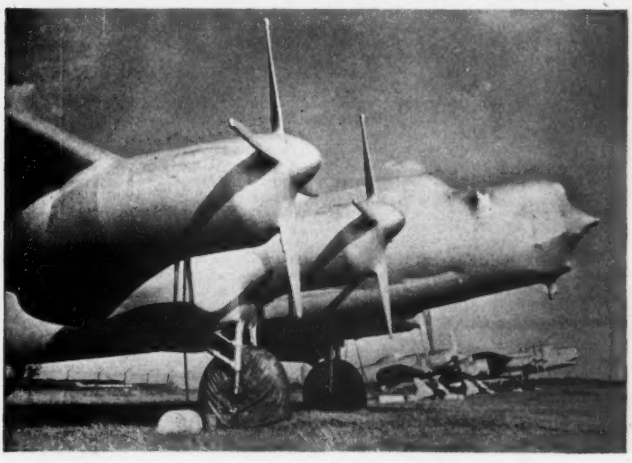
* * *

A particularly glossy finish was noticeable on Hugh Kendall's Chilton in the South Coast Race, and no doubt helped towards the handsome margin by which it beat the handicappers. We learn that it was the high-gloss scheme formulated by Docker Brothers for light aircraft.

* * *

Recovery of high-quality light metals from scrap will be the subject of a lecture on Oct. 17th by Col. W. C. Devereux, C.B.E., managing director of Almin, Ltd., before the Institute of Metals. It will be part of a symposium on *Metal Economics*.

AIRTIGHTNESS FOR AIRWORTHINESS: We recently showed how a helicopter fuselage looks when subjected to the patented "Cocooning" process for storage; this is how Lincolns and Tempests—now being used by the R.A.F. as test-pieces for the process—appear when the sprayed-on plastic "skins" have been applied. A London firm, R. A. Brand and Co., Ltd., hold the rights.



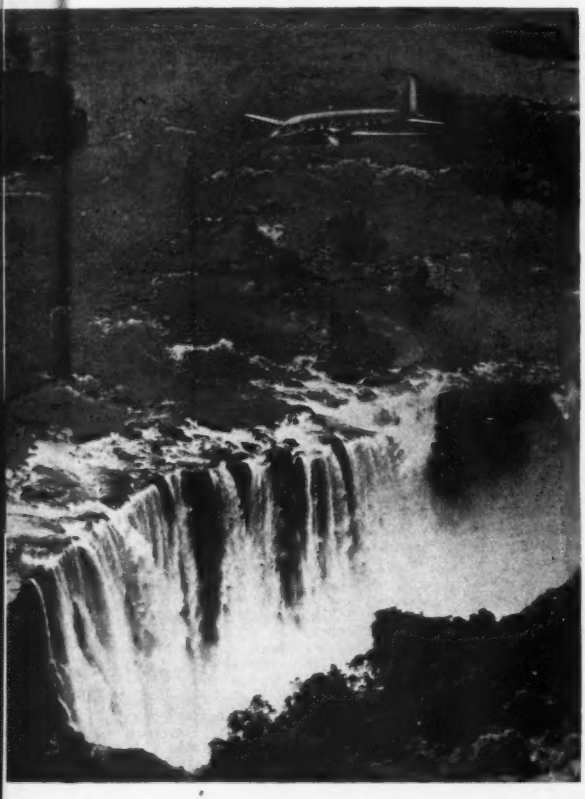
NOT-SO-DARK AFRICA

An account of Some Pleasant Journeyings on the Routes of Central African Airways

By GEOFFREY DORMAN, A.R.Ae.S.

THIS is another of Mr. Dorman's "airline tours," in which he sketches the organization and equipment of the operators and then goes on to describe places and people on the routes. In this article comparatively little space is devoted to the new airport at Livingstone, for the reason that it was very fully described in "Flight" a year ago, at the time of its inauguration. Those who wish for a somewhat fuller history of Central African Airways, also, are referred to that issue (August 10th, 1950).

IN July last I made a tour of many of the routes operated by Central African Airways Corporation, known throughout Northern and Southern Rhodesia and Nyasaland as C.A.A. Though a very young concern—it is one of the youngest members of I.A.T.A.—it springs from forebears with a long history. In 1918 a company called Air Road Motors, Ltd., was formed by ex-members of the flying Services in the 1914-18 war with the object of bringing air-mindedness to the heart of Africa! This concern toured Southern Rhodesian towns and population centres with aircraft such as Avro 504Ks and D.H.6s, giving joy-rides to people who had never even seen an aeroplane before. Records do not show that the company was very active in those days with passenger air transport.



In 1933 the first real step towards organized air carriage within Central Africa was made with the formation of Rhodesian and Nyasaland Airways, Ltd., known as R.A.N.A., a name still honoured in Salisbury and Bulawayo. The company was closely associated with Imperial Airways, Ltd. (which was then opening its route from England to South Africa) and the Beit Trust. R.A.N.A. operated independently until the war came in September, 1939, when they were taken over by the Government of Southern Rhodesia. During the war the company, under the title of Southern Rhodesia Air Services, operated as a communications squadron and maintained essential services in the Rhodesias and Nyasaland, as well as with neighbouring territories.

In June, 1946, the Central African Air Authority and Central African Airways Corporation were formed to absorb S.R.A.S. and open up Central Africa for air travel. The capital was subscribed by Southern Rhodesia with 50 per cent, Northern Rhodesia with 35 per cent, and Nyasaland with 15 per cent. Any subsidies since required have been subscribed in the same proportion.

Like the East African and West African Airways Corporations, C.A.A. retain as technical consultants B.O.A.C., whose representative, Stiven Ogilvie, is resident in Salisbury, and who ensures a close and cordial liaison between the two organizations.

C.A.A. has headquarters in Salisbury, with offices in the town and at Belvedere Airport, just north of the city. Belvedere is scheduled under town planning to become a residential area, so a new airport for both civil and military use is under construction at Kentucky, to the south of the city, and will be partly opened for Air Force use by the end of 1951. The whole scheme is due for completion by 1953 and, with most modern blind-flying aids, a fine terminal port building and hotel, and two runways of 4,000 yards both capable of extension to 7,000 yards, will constitute one of the finest airports in Africa and will be able to take airliners of up to 200 tons. At present it is 7½ miles by road from the centre of Salisbury, but when a new straight highway is completed the run of 5½ miles should be able to be made in ten minutes.

At present the C.A.A. fleet consists of seven Vikings, five Doves, and three D.H. (Canada) Beavers. The last-named are used for services to the midlands of Southern Rhodesia where there are only small grass strips not good enough even for Doves; on occasions the Beavers have been able to use straight stretches of road for take-off and landing.

I flew to Livingstone in a Hermes of B.O.A.C.'s No. 2 Line, the flagship *Hannibal*, G-ALDI. From London Airport to Kano the crew was Capt. "Mac" McDougall, 1st Off. Bob Harwood, Nav./Off. Neville, Eng./Off. Hillier, R./Off. Guthrie, 1st Steward Hogan, 2nd Steward Howarth, and Stewardess Baxter. We left London on a fine hot morning which prepared us well for the first taste of heat at Castel Benito. When we landed, there was a great array of Hastings and Yorks standing by in case an urgent visit in force to Persia became necessary. Many of the Yorks had been hurriedly chartered from B.O.A.C. freighter fleet and R.A.F. roundels had been painted over the familiar Speedbird livery. The crews, too, were B.O.A.C. officers called back to the reserve.

We flew on across the Sahara Desert to Kano, where we arrived at 2 a.m. the next morning just after a line squall had passed over; the sandy desert airport was running with water and myriads of flying ants had come out to greet us—and pester us during the 75 minutes we were on the ground. *Hannibal* was given a drink of petrol and the passengers tea, coffee and soft drinks.

We took off with a new crew; Capt. Denis Hider, 1st Off. John S. Hudspith, Nav./Off. Vincent, R./Off. Bone, Eng./Off. Painter, 1st Steward Blackstone, 2nd Steward Saunders, and Stewardess Glynn. There were several schoolboys travelling for the holidays to their parents in Central Africa, and the skipper, who himself has a small son who is growing up in the traditions of the air, saw to it that those boys who were interested were shown over the flight-deck; he realizes that such boys will be enthusiastic air travellers of the not-so-very distant future. The special cheap rates allowed by the British airlines to children is a very wise long-term policy which is bound to pay dividends.

One of the scenic wonders of the world—the Victoria Falls—lies on a C.A.A. route. In this picture is one of the Corporation's Vikings.

STATUTE MILES SHOWN THUS 430

(Left) The trunk routes of Central African Airways' network, with mileages. There are also several feeder routes.

(Right) Though lacking concrete runways, the airport at Lusaka—snapped here from a Dove—has large, modern buildings.

After an intermediate landing at Brazzaville for refuelling we flew on to Livingstone, where we landed, half an hour ahead of schedule, at 6 p.m., after a preliminary circuit of Victoria Falls, which gave us a fine view. There I was greeted by Alan Collins, B.O.A.C. station manager, who I had previously met when he was in charge of the old flying-boat base on the Zambesi, five miles distant. I was also glad to meet Off. Cdt. John Ellis, an ex-A.T.C. cadet and member of the West London Aviation Club, who was on leave from Heany, near Bulawayo, where he had just made his first solo flight.

I was driven across the Zambesi to Victoria Falls Hotel *via* the Falls Bridge and so into Southern Rhodesia. Livingstone Airport is in Northern Rhodesia, so I had to go through further immigration formalities before I was liberated to go to the Victoria Falls Hotel, where I stayed two nights as the guest of C.A.A., into whose kindly hands I had been delivered. Their representative Norman Bradshaw took me to get close-up views of the famous Falls, which seem a more wonderful sight each time I see them; and, of course, I had to "call on" George, the well-known giant giraffe in the game park nearby.

After a full day and all the next morning to satiate myself with the sight and sound of the Falls, I was driven to Livingstone Airport, where I embarked in C.A.A. Viking VP-YIE, *Limpopo*, with Capt. Frank Flote, 1st Off. Keith Henderson, R/Off. Bray, Eng/Off. Dunkley, and Flight Attendant (Stewardess) Morgan. Capt. Flote took us for a close circuit of the Falls before turning north-east on course for Lusaka, the capital of Northern Rhodesia, 236 miles away. We flew over a fertile tobacco-growing region and several rivers—mostly with water in them, which is unusual in many parts of Africa in the dry season. Just before reaching Lusaka we crossed the broad Kafue River, across which there is a new road and railway bridge—actually the identical temporary bridge which was put across the Thames at Charing Cross as a precaution during the Blitz of 1940.

We stopped for only ten minutes at Lusaka, which has a grass runway but modern buildings, with a big steel hangar which had previously been erected for Imperial Airways at Broken Hill. The next leg, to N'dola, was one of 168 miles which took us over the mining town of Broken Hill that figured so prominently as a landing ground for the pioneer flights from England to South Africa. We landed at N'dola just before dark—a good airport where I was met by Gordon Mollett of C.A.A., and he drove me into the town, administration centre for the wealthy copper-belt which mines a very big percentage of the world's copper. This area, where in the heat of Central Africa I saw smelting furnaces reminiscent of Birmingham, is producing great wealth; soon it may become such an important centre that it will be a focal point for the routes of C.A.A., who are well aware of possible developments.

This was July, which means winter in the southern hemisphere, and the nights were very cold; and I really felt I was back in good old England when all the lights were extinguished by a power cut. The next day Gordon Mollett drove me to Kitwe, 40 miles away, to see the famous N'kana copper mine, a prodigious feat of modern engineering right in the heart of Darkest Africa; not much more than twenty years ago this was the undisputed haunt of lion, elephant, buffalo and other game.

The following day I flew in Viking VP-YEY *Shangani* back to Lusaka. The crew were Capt. "Ting" Orbell, 1st Off. Allen Petzer, R/Off. Forbes, and Flight Attendant Johnston. Visibility seemed good—about 20 miles—but the crew told me it was not as clear as usual because of a brown haze caused by smoke from forest fires. I was met by Doug Macintosh, a young and very keen type who was temporary C.A.A. representative, pending a reshuffle. He drove me round this almost unknown capital city of Northern Rhodesia, and I was impressed by the layout for potential development. Lusaka has in recent years superseded Livingstone as capital of Northern Rhodesia, as it is much more central both for the tobacco-growing industry and the copper belt. At present it consists mainly of government offices, but it has a well-planned shopping centre and residential area.

To go by train from N'dola or Lusaka to Bulawayo or Salisbury it is necessary to travel far west to Livingstone and change trains there—a long, hot and exhausting journey. The air journey from N'dola to Lusaka normally takes 50 minutes, and from Lusaka to Salisbury takes under two hours. From Livingstone to N'dola, N'dola to Lusaka, and Lusaka to Salisbury the aircraft were quite, or nearly, full, for air travel in Central Africa means a great saving of time.

Take-off the next morning was at 9.15 in Dove *Egret*, VP-YEU, with Capt. Dave Allan and R/Off. Hobbs. Twenty minutes after take-off we came up to the Kafue River and ten minutes later I saw the confluence of the Kafue and Zambesi. This is land which is waterlogged in the rainy season and is, I am told, a happy hunting ground for elephant, hippo, and crocodile. However, though we came down to 1,000 feet to take photographs, I could see no game.

We turned on to a westerly course here and flew over the Karibi gorge, where the Zambesi flows through some mountains of volcanic origin. West of this gorge a vast irrigation scheme is under way, where a great area is to be inundated by damming the Zambesi. A similar dam is to be constructed close to Salisbury, which should keep that centre on the map if flying-boats once again become a dominating factor in air transport (as many people believe they will, because of the increasing size of the airliners of

Like the Vikings, the Doves operated by C.A.A. have given faithful service.

NOT-SO-DARK AFRICA . . .

the future). With its artificial and natural lakes and its rivers, Central Africa is ideal for flying-boats of all sizes.

When I arrived at Belvedere Airport, Salisbury, I was met by W. T. Denyer, who runs C.A.A. publicity. He took me to see Bob Wieland, the commercial manager, who used to be traffic manager of Jersey Airways, and was also with B.O.A.C. at Foynes. I also met the genial general manager, R. G. McCoy, who had returned for one day only from his constant tours of inspection and search for new forms of enterprise which will bring yet more business to this go-ahead corporation.

Next day I flew on the daily "commuter" service from Salisbury to Bulawayo, 222 miles. By train the journey takes 12 hours, but by air only 75 minutes. The service runs in each direction morning and evening, so that Salisbury people can go to Bulawayo for the day and *vice versa*. The return fare is £8 10s., and it can be kept so low because the aircraft have nearly full loads both ways. The Vikings of C.A.A. carry 27 passengers; we had 26 from Salisbury to Bulawayo and 27 for the homeward run. When I was at the town booking centre in Bulawayo an hour before take-off, there was a notice board outside giving in chalk figures the number of vacant seats at the moment. When I left for another call before going to the airport there were four vacant seats. People have got into the habit of phoning or calling at the last moment to see if there are vacancies, and when we took off at 6 p.m. the four seats had been sold. I also noted that on the cheap night "star flight" to Johannesburg there were three vacant seats. The service leaves Salisbury at 8.30 p.m. and arrives at Jo'burg at 12.30 a.m. It leaves Jo'burg again at 1.30 a.m. and reaches Salisbury, after a call at Bulawayo, at 5.30 a.m. Return fare from Salisbury to Bulawayo on this night service is £8; Bulawayo to Jo'burg is £16; and right through from Salisbury to Jo'burg it is £21.

When I flew back from Bulawayo to Salisbury, leaving just as it was getting dark, the atmosphere was like that of a "club car" on a train. Everyone seemed to know everyone else, and the flight attendant was kept busy serving drinks most of the time. As we neared the airport we approached over Salisbury, a fine, bright blaze of light. Capt. Flote was again my skipper, both out and home.

Next morning Bob Wieland called at Meikles Hotel to drive me to the airport for my final departure. I had breakfast at the airport restaurant, as is customary on these early morning starts, and at 7.45 a.m. I embarked in Viking VP-YST *Shire* (all C.A.A. Vikings are named after African rivers, and Doves after birds.) The crew were Capt. R. A. Mackie, 1st Off. Derek Lane, R/Off. Hilton, and Flight Attendant Hickman. We had a full load as far as our first stop, Blantyre, which is the commercial capital of Nyasaland. The terrain east of Salisbury is rocky granite hill, typical of much of Southern Rhodesia. On the way to Nyasaland we passed over a corner of Mozambique, and over the Zambesi, which, while not by any means running high, was full of water in comparison with the many dry river beds we had passed over in Rhodesia. As we neared Blantyre the country became very steep, and we passed over the River Shire, which flows from Lake Nyasa to the sea, at a point where the river was cataracting down a mountain pass.

The airport of Blantyre, which we reached in 1 hr 55 min from Salisbury, is 12 miles from the town, this being the nearest flat piece of ground. We stopped for only 25 minutes and then flew on, crossing Mozambique again till we reached the border of Tanganyika, and after 3¼ hours we landed at the airport of Dar-es-Salaam, after having eaten an excellent cold lunch served on board. As we neared our destination we encountered the first cloud which I had seen for a week, as Rhodesia in winter is cloud-free for most of the time. At Dar-es-Salaam, which means "Haven of Peace," we were approaching Equatorial weather, so cloud became more frequent. As we orbited the town and harbour I noted two hulks of German ships which had been there since being sunk in the 1914-18 war, when Tanganyika was German East Africa. I was met at the airport by A. B. Ginns, who is C.A.A. liaison officer with East African Airways at Nairobi; he was at Dar-es-Salaam to superintend some special C.A.A. charter flights. He handed me over to Denis Lloyd of E.A.A.C., with whom I continued my tour.

Beside the routes I have described, C.A.A. operate a Viking service to Nairobi; this is an extension of the Salisbury-N'dola service *via* Tabora to connect with the B.O.A.C. service from Nairobi to London, and with Aden Airways to the Middle East. There is also a very popular holiday service to Salima and Monkey Bay on the shores of Lake Nyasa, and another to Lourenço Marques on the Indian Ocean coast of Mozambique.

One of the most remarkably successful innovations has been a Sunday excursion trip from Salisbury to Victoria Falls and back, 680 miles for a return fare of £10, which includes a box lunch, a boat trip up the Zambesi to see elephant, hippo and crocodile, a coach trip to the Falls, and tea at the Victoria Falls Hotel before returning to Salisbury. The trip was first put on as a "special" one Sunday, after Mr. Denyer had heard a friend in the club say he had never seen the Falls. All seats were soon booked up, with an overflow to ensure its running for another three weeks. So the trip became a regular one and is still fully booked for several weeks ahead. It is this steady demand, of course, that makes the low fare possible.

Like nearly all other airlines, C.A.A. are at the moment considering the aircraft with which they will replace their present fleet in the near future. They have been so satisfied with Vikings they are likely to adhere to Vickers-Armstrongs and may well order Viscounts, which will give them the extra seating which future traffic will surely justify. They have also considered Hermes, which they think they might get cheaply when B.O.A.C. replace theirs with Comets. A possible objection to the Hermes is that its landing speed is a little high for some of the grass airports in Northern Rhodesia and elsewhere. For smaller replacements the Heron or Marathon might well fill the bill, or the Apollo for an intermediate size.

C.A.A. is undoubtedly proving a great boon to dwellers in Central Africa, and if more modern aircraft enable fares to be greatly reduced, then the future is indeed bright, for these young countries are only at the very start of enormous developments which may make them among the richest in the world. Aircraft manufacturers who get in on the ground floor should do well.

VERY-DARK AFRICA

"I'll Fly No More", by Ursula Barnett Potter. George Allen and Unwin, Ltd., Ruskin House, Museum Street, London, W.C.1. Illustrated. Price 18s.

THE title sets the keynote to this book, which describes a flight from Europe *via* East Africa and another round the Belgian Congo, both made by the author in a Fairchild Argus piloted by her husband; on the former trip they carried their two children as passengers.

Many people who are given to flying vast distances over inhospitable country—and this includes world-famous record-breakers—admit that they hate doing it, but are impelled by that overwhelming fascination which aviation has always exerted upon the adventurous. Even so, most of them who have written or lectured about it afterwards have recalled rewarding experiences—magnificent scenery, perhaps; an unforgettable sunrise; or meetings with pleasant people.

The Potter *ménage*, on the other hand, seems to have experienced little else but nil visibility, stuffed clouds, sandstorms, quagmired airstrips and the most unco-operative, officious or indifferent lot of petty officials that any air tourist could hope not to meet; even the R.A.F. people in the story mostly seem to fall into the indifferent category, and almost the only satisfactory encounters are with the ubiquitous Mr. Shell.

This being so, and the Fairchild's owners apparently being under no compulsion to fly for fame or reward—they are air tourists pure and simple—this book makes one wonder why they bother to do it at all. The author is clearly not an unwilling or trepid passenger, and sounds like a reliable navigator. She is also a capable writer.

We recommend the book as a useful *Warning to Those About to Fly Through Darkest Africa;* others may feel that 213 pages of trials and tribulations and a dozen not very inspiring photographs come a little expensive at eighteen shillings.

CHRISTMAS-GIFT IDEA

"The Wonder Book of the R.A.F." Ward, Lock and Co., Ltd., 6, Chancery Lane, London, W.C.2. Illustrated. Price 12s 6d.

THIS addition to the classic series will recall to older readers those much-thumbed companions of their youthful days, the *Wonder Books* of trains, of ships, and of other fascinating marvels. The publishers have maintained the standard of quality established in previous years and have included the usual large number of illustrations together with, in this volume, eight coloured plates by such artists as Wooton and Franklin. *The Wonder Book* reviews, among other things, the history of the R.A.F. since the formation of the Royal Flying Corps in 1912, and a chapter has been devoted to the gas turbine. Probably most stimulating to the modern generation, however, will be the section which deals with the training programme which the present-day pilot must undertake to fit him for his exacting duties.

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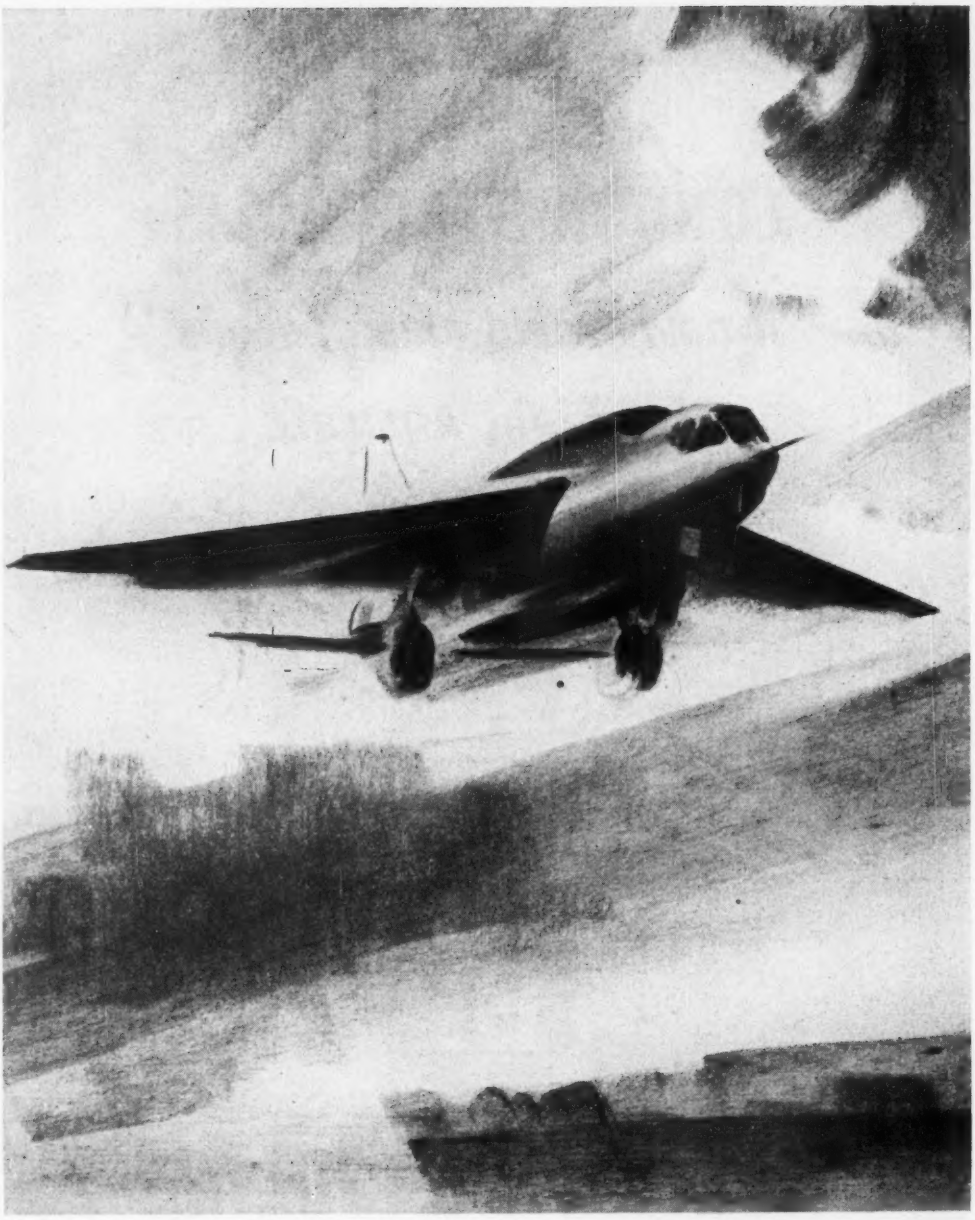

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THE EARTH SATELLITE VEHICLE

Summaries of Lectures Before The International Astronautics Congress

As briefly recorded in *Flight* of September 14th, the second International Congress on Astronautics took place in London last month. The following are summaries of the lectures delivered on that occasion, and we give them as an indication of the large volume of responsible scientific opinion now being devoted to the subject.

MR. L. R. SHEPHERD, Ph.D. (technical director, British Interplanetary Society), spoke, in the introductory paper, on "The Artificial Satellite." He said that a stage had now been reached in the development of rocket propulsion where, with moderate advances in technique, it became possible to produce a manned satellite vehicle and later to proceed to interplanetary flight. It was, in fact, evident that some work was already in progress to develop the satellite vehicle for military purposes, but exclusive military exploitation of space-flight would be deplorable; it was desirable that a project, for purely scientific purposes, should come into being under a civilian authority.

The importance of the satellite vehicle or orbital space-station lay mainly in its application to interplanetary flight. It was now generally agreed that the requirements of a vehicle, making a non-refuelling return flight to the Moon or other planets, were too severe to be met by existing methods of propulsion. However, if one could accumulate sufficient fuel and materials in a close orbit about the earth, it would be possible to proceed from there to the surface of the Moon and back. The attainment of a circular orbit at a height of 500 km above the earth's surface would not prove too difficult. A three-step rocket with an exhaust velocity of 3 km/sec, an effective mass-ratio of < 50 and a ratio of initial mass to payload of c 300 should be capable of achieving this orbit.

This performance was not outside the range of present techniques. However, we should need to do better, before proceeding on to the next stage of interplanetary flight, otherwise we should be forced to carry out a "lift" involving hundreds of flights by satellite vehicles before we had accumulated sufficient materials in the orbit. Improvements would be required, both in the performance of the satellite vehicle and in the subsequent interplanetary vessel in order to bring the project down to a reasonable economic level.

Improvements in the satellite vehicle might be achieved with chemical propellants or might lie in the application of nuclear energy. In the case of the inter-orbital vehicle, however, one might go to a new principle, making use of very high exhaust velocities ($\sim$100 km/sec) at very low accelerations ($\sim 10^{-3}$g). This could be done in an "ion-rocket," employing a propulsive jet consisting of a beam of electrically accelerated ions. Such a vehicle would not be capable of landing on the surfaces of planets but would be capable of executing large velocity-changes with low mass-ratios, operating exclusively between satellite stations—for example, between an earth-satellite and the tiny Martian moons Deimos and Phobos.

Space-flight might, therefore, be carried out in two types of vehicle, viz., satellite vehicles having low exhaust-velocity and high thrust and operating from surface to orbit, and interplanetary space-ships having very high exhaust-velocity but very low acceleration and operating between orbits. Permanent orbiting space-stations might be included in this scheme to act as the junctions between the two types of vehicle, but they would not be essential to the scheme. Space-stations and ion-rockets might draw propellants and other massive materials from bases on small satellites or the asteroids to avoid having to lift these through large gravitational potentials.

DR. WERNHER VON BRAUN (Honorary Fellow of the Society), discussed "The Importance of the Satellite Vehicle as a Step Towards Interplanetary Flight." Once the technique of establishing satellite rockets in stable orbits around the earth was perfected, he said, these could be used to refuel other rockets. Interplanetary flight would then become possible, even using present chemical propellants. By this means, it would be unnecessary to await the development of nuclear-powered rockets, which were unlikely to appear, in a form competitive with chemical types, for about 25 years. In any case, the danger from their radio-active exhausts would make it desirable to operate them also from initial satellite orbits, rather than from the Earth's surface.

A successful satellite rocket would need to have at least three steps. Recovery of the lower steps by parachute, for re-use, was believed to be practicable; the final step could be landed back on earth by fitting it with wings, if its orbital velocity was initially reduced by rocket braking. Conditions of landing speed and aerodynamic heating had been discussed and were acceptable.

As an illustration of the use of orbital refuelling technique in interplanetary flight, a hypothetical expedition to land about 50 men on Mars was considered, using hydrazine as fuel and nitric acid as oxidant. Forty-six three-step satellite rockets would haul spaceship components and propellants out to the starting orbit, making 950 flights in the process. Each would have a take-off weight of 6,400 tons.

After assembly of ten space-ships in the orbit, 70 men would fly to another terminal orbit around Mars. These ten ships would each weigh 3,720 tons initially, would require no streamlining, and use motors of low thrust. About 50 men with supplies would land on Mars, in three small 200-ton rockets. They would abandon one on the surface, and return to the waiting parent space-ships in the remaining two. These, in turn, together with three of the space-ships, would be abandoned in the Martian orbit, and the 70 men would return to Earth in seven of the space-ships, being met in the satellite orbit by sufficient of the first satellite rockets to land them back on the surface. The whole expedition would last two years 239 days, plus about eight months for the preparatory supply operation, and would admittedly be expensive, though the expenditure would be small compared with armament budgets.

ING. G. VON PIRQUET (Austria) said that the first step towards the establishment of a space-station would be the "long-distance rocket" having a maximum range of about one half the Earth's circumference. Much of this distance would have to be used for braking, as would also be the case with transport rockets to and from a space-station. The maximum speed of these long-range rockets would be 6-7 km/sec and considerable problems would arise from aerodynamic heating. Later, orbital rockets would be built for practising manœuvring, refuelling in space, etc. The final step would be orbital transport rockets and the construction of the space-station. In the first instance, the hulls of a number of the transport rockets could be used as a skeleton.

The space-station would have a number of uses—as an astronomical observatory, for astrophysical spectro-analysis, for radio and television transmission and weather observation. Astronautically speaking it would be of inestimable value for refuelling space-ships.

The Problem of Descent

MR. T. R. F. NONWEILER, B.Sc., B.I.S., described the application of some of his theoretical work (mostly as yet unpublished) to the problem of the descent of an aircraft from a circular orbit. When the aircraft reached the denser regions of the atmosphere, it was assumed that the remainder of the descent was a shallow dive during which the aircraft, supported by the lift of its wings, gradually slowed down. The theoretical work was intended to provide an estimate of the temperature reached by the aircraft.

PROFESSOR LYMAN SPITZER, Jr., of Princeton University Observatory, dealt with interplanetary travel between satellite orbits. While it appeared possible, he said, to project a multi-step rocket into a close orbit about the Earth, with the help of existing techniques, the next step of proceeding from this orbit to the surface of the Moon or another planet and back would require prohibitive quantities of conventional propellants. The application of nuclear energy to heat up a propellant in a conventional type of rocket did not appear to offer a substantial improvement on the chemical rocket because of limitations on temperature and power rating, which prevented the achievement of very high exhaust-velocities and the high thrusts needed to lift against gravitational fields.

In the case of an interplanetary ship operating between a circular orbit around one planet and a similar orbit around another, without making a landing, however, it was possible to employ a new principle which might effect great economies in the amounts of propellants and materials which must be carried up into the orbits. This principle depended on the fact that such a ship could be propelled by very low thrusts whence it was possible to use high exhaust-velocities without involving excessive power production. The high velocity would result from accelerating a beam of ions in an electric field, power being provided by a nuclear reactor.

DIPL. ING. H. KUHME (Stuttgart) spoke of the start, return and landing of an "optimum satellite step rocket." The aerodynamics of such a rocket were considered and it was pointed out that at various times during its operation flight in four different regimes was necessary, namely, subsonic, transonic, supersonic (Mach number up to 20), and in the condition encountered at great heights, where the mean free path and air molecules was large compared with the linear dimensions of the rocket. In practice the flight Mach number would simultaneously be high (20 or above). Different laws of flow applied for all four regimes, which complicated the aerodynamic design.

THE THROTTLE-BENDERS

No. 2. . . . J. N. SOMERS, A.F.C.

By H. J. COOPER

THIS is the second of a series of articles describing the air-racing careers of the present six members of the "Throttle Benders' Union"—the unofficial brotherhood of regular participants in British air races. The other five pilots are S/L. J. Rush (the subject of the first biography in this series, published in "Flight" of July 6th last), R. R. Paine, A. L. Cole, C. G. Alington and F. Dunkerley.

"Flight" photograph

The highlight of Somers' racing career to date was his victory in the 1949 King's Cup Race at Elmdon, when he brought his Gipsy-engined Gemini into first place at 164.25 m.p.h.

NAT SOMERS, 1949 King's Cup winner, has been flying for 14 years, and now, at the age of 42, flies his Gipsy-engined Gemini for business and sporting purposes. He has nearly 5,000 hours in his log-book.

Nat's first interest in flying began when he was on holiday at Bognor in 1937. He drifted casually over to the airfield at Ford, where the Yapton Aero Club was supplementing its income by giving joy-rides, and had ten bobs' worth. Soon he was chatting with Dennis Holland, a young instructor with the Club, who talked him into the idea of taking a licence. At that time the enterprising Yapton Aero Club was operating an all-in flying course (up to "A" Licence standard) for £25, which was cheaper than any other club's figure. The idea was that pupils could gain their licences during their holidays.

After eight hours' dual instruction on a Cirrus II Moth Nat went solo, and after a few more hours took his licence, eight days after beginning lessons. His Royal Aero Club Aviator's Certificate is dated August 11th, 1937, and numbered 15,208.

Nat was then, as now, engaged in the electrical and glassware manufacturing and distributing business, and it was, in fact, he who started Jimmie Rush in the same line.

Nat became a member of the Isle of Wight Flying Club at Lea, and later of the London Air Park Flying Club at Hanworth; he also joined the Civil Air Guard.

On the outbreak of war in September, 1939, Nat, at the age of 28, volunteered for, and was enlisted in, the Royal Air Force. Unfortunately (and this amuses him) he was told officially that he was too old to become a pilot. Continued applications met with such replies as "you are informed with regret that your age precludes your consideration for duties as a pilot"; but finally he was accepted for non-operational duties. He was graded suitable as a flying instructor (his experience obviated the need for attending at an Initial Training Wing) and, as "A.C. Plonk," he was posted to the F.I.S. at Cambridge for an instructors' course. After passing out he taught pupils *ab initio* on Tiger Moths.

His next station was Sywell, Northampton (where W/C. I. W. C. McKenzie, A.F.C., was C.O.) and there he had the job of instructing French and Belgian pupils who had come to England after their own countries had been overrun in 1940. The difficulties here mostly related to language. These pupils spoke no English, and Nat's French was limited to such terms as *decollez* and *atterrirez*, while the exhortation *doucement!* was put to extensive use. (But if Nat happened to say, "O.K., you can pack up early today," they understood immediately !)

While at Sywell (No 6 E.F.T.S.) F/Sgt. Somers sent his first 114 pupils solo in under eight hours each; the former average for "graders" was 30 per cent sent solo in 12 hours. He never sent a pupil to another instructor, which must indeed be a tribute to his patience and general psychological aptness for the job. In 1943, when still at Sywell, Nat learned of his award of the Air Force Cross, which was for outstanding services in instructing.

By this time he was a flight lieutenant, and next went to the Advanced Flying Unit at South Cerney. Here he flew mostly Oxfords, giving instruction to pilots converting to twin- and multi-engined aircraft. He was also attached for a time to Mount Batten, flying Short Sunderlands, and then was posted to an S.B.A. instructional school at Swanton Morley, Norfolk.

No. 1 E.F.T.S. at Panshanger (now the home of the London Aeroplane Club) was his next appointment, in 1945, and here he gave night-flying courses to instructors.

So for the whole period of the war Nat was engaged in the exhausting business of training pilots for the ever-growing R.A.F. He doesn't know just how many pupils he put through, but it was, as he says, "quite a few."

And So To Racing . . .

Somers' first race was at the 1946 Lympne meeting, when he flew a Proctor I, G-AGWV, in the Folkestone Aero Trophy race. The three heats for this event were flown on August 31st, and Nat, finishing third, got into the final, which was to be flown the next day. In the final he reached sixth place, flying the Proctor at 141.5 m.p.h., the race being won by John Grierson in an old Walrus amphibian.

By the following year Nat had bought a Hornet Moth, G-ADSK, and he entered it for the Isle of Man Air Races, which were being revived for the first time since 1939 and were flown on Whit Monday. There were two main events: the Manx Air Derby for aeroplanes of over 120 h.p. and the Tynwald Air Race for those of less than 120 h.p. Both were flown concurrently over a course which consisted of three circuits of the Island, making a total of 158 miles. Nat had been accepted for the Tynwald race, and after Tommy Rose (in a Hawk Speed Six) and Bruce Campbell (in the T.K.2) had passed him to gain first and second places in the Manx Race, found himself first in the Tynwald, flying at 116 m.p.h.

But he was not the winner. Back at his hotel he had a visit from the stewards of the meeting, who told him that, by an oversight, he had been erroneously accepted for the Tynwald race: the Hornet Moth's Gipsy Major engine was officially rated at 118-122 h.p., which put him into the "over 120 h.p." class. This was really bad luck, for it was not his fault; but the fact that he was third in the Manx Air Derby compensated a little for his natural disappointment.

On August 9th, 1947, Nat again raced his Hornet Moth, this time in the Southend Air Trophy Race. The course was three laps of a 20-mile circuit, and there were 11 starters.

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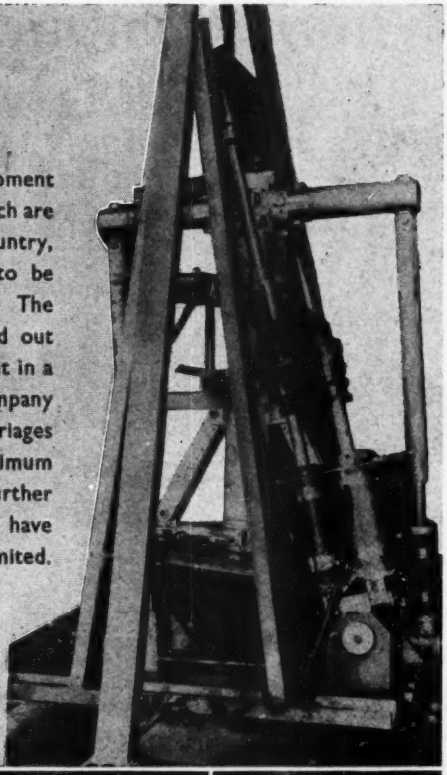

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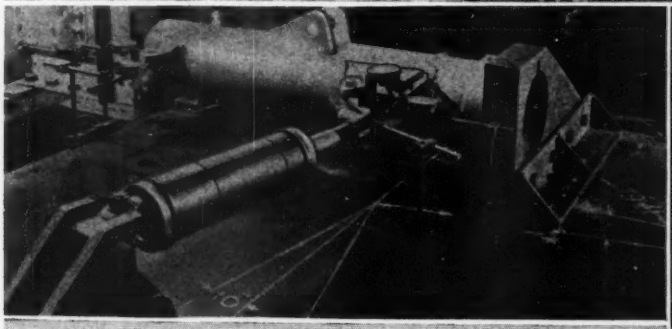

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"Flight" photographs

(Left) Nat Somers—"too old for flying," according to the Air Ministry—instructed hundreds of pupils during the war; among them, as seen here were many Belgians and Frenchmen. (Right) G-AKDC, the Gipsy-engined Gemini III, in which Nat has achieved his more recent speed successes.

THE THROTTLE-BENDERS . . !

In his heat Nat finished third, but in the final he was just beaten to the winning post by Ron Paine in a Hawk Trainer. Nat averaged 117.75 m.p.h. and made second place just ahead of Paul Godfrey in a B.A. Swallow.

At that year's Lympne meeting, on August 30-31st, Nat, still flying the Hornet Moth, competed for the Folkestone Aero Trophy again. He was third in his heat, the speed of his aeroplane having been increased to 119.5 m.p.h. since the Southend race; but, when he lined up for the final, magneto trouble developed and he could not get his engine started. Paul Godfrey flew his Pobjoy-Swallow in to first place at 96 m.p.h.

The greatest achievement in Nat Somers' career is, naturally enough, the winning of the King's Cup in 1949, for every racing pilot, over many years, has set his heart on gaining this trophy.

Just before the race, which was held at Elmdon Airport, Birmingham, Nat was on holiday with his wife in France, and wondered whether or not he should cut his holiday short to come back and compete. He had, by this time, bought a Miles Gemini III, G-AKDC, the first to be fitted with Gipsy Major engines, and decided he could not miss the chance of flying in the King's Cup. Consequently, he flew the Gemini back and put it into racing condition by the usual process of stripping off everything not absolutely necessary.

A Hundred Dark Horses

Certainly the R.Ae.C. handicapping team had not quite got a line on this Gipsy Gemini, which has 100 h.p. more than the standard Gemini with Cirrus Minors, and Nat won his heat at 165 m.p.h. The course consisted of three laps over a 20-mile course. Towards the end of the final it became clear that the Somers Gemini would be well to the front. As it was, he came in well ahead, flying at 164.25 m.p.h. (the average for the whole course) and realized that a shortened holiday in France can be compensated in other ways. Tony Cole was battling along towards second place in his Comper Swift, but over the airfield boundary Ron Paine (Hawk Speed Six) caught and passed him to gain second position. It was a most exciting finish.

Nat had also entered for two other contests in that year's —the first—National Air Races: the Norton-Griffiths Challenge Trophy (in the Gemini) and the Siddeley Trophy, when he flew his Hornet Moth as representative of the now defunct United Services Flying Club of Elstree. In the latter event, although the Hornet was flying better than before, he did not gain a place. After landing he discovered that he was out of fuel; the tank had not been properly filled, and the fuel-gauge (as is so often the case) was u/s. He also had bad luck in the Norton-Griffiths race: his starboard airscrew came off in the air in the first of the three laps. It cut the fuselage badly, but Nat carried on back to Elmdon, where he managed to put down the Gemini safely.

Somers had made fourth place in the 1949 Goodyear Trophy race, held at Wolverhampton on May 26th. It was, in fact, the first race in which he piloted the Gemini, and after a very close finish he found himself in fourth place, although at that time the Gemini attained only 155 m.p.h in the final. Giles Reid-Walker (who recently lost his life in a road accident) in a Piper Super-Cruiser, Ranald Porteous in an Auster Arrow and Donald McCaskill (Auster V) were all very close together at the finish, making first, second and third places respectively.

Varied Fortune in 1950

Nineteen-fifty was a very full racing year for Nat. The National Air Races were decentralized and held at various aerodromes throughout the country. He again entered the Gemini for the King's Cup, held at Wolverhampton, but was not placed. The course had been fixed at 100 km length (62.137 miles, composed of three laps of 20.7 miles each) so that a number of competitors could also make attempts on the closed-circuit record in various weight categories. The Gemini comes within Class C. Ic (1,000-1,750 kg) and concurrently with the race Nat and Jimmie Rush fought out a personal duel for the record. Nat eventually gained it, lapping at 168.44 m.p.h. That record was confirmed and still stands in the official F.A.I. list as an achievement for Great Britain.

At Leeds on July 22nd, 1950, Nat reached fifth place in the Air League race, making 166 m.p.h. in the Gemini. The slightly slower speed was accounted for by the fact that one of the cabin windows blew out during the last lap.

The following week-end the Norton-Griffiths race was flown at Newcastle-upon-Tyne, and the Gemini made fourth place at 164 m.p.h. The precise flying and navigation which puts Nat in an excellent position for instructing is indicated by the fact that the last four laps were covered, respectively, in 7 min 22 sec; 7 min 22 sec; 7 min 21 sec; and 7 min 22 sec —three laps in precisely the same time and one in one second less !

In the Kemsley race at Swansea (on August 19th) he gained fourth place, getting 168.5 m.p.h. out of the Gemini.

On August 26th, Thruxton was the scene of his next race. The Wiltshire Flying Club had organized a race from their airfield to Totland Bay (Isle of Wight) and back, a total distance of 75 miles. There were 15 starters for this event, and Nat took off next to scratch man, Geoffrey Alington in a

THE THROTTLE-BENDERS . . .

Sparrowhawk. Nat pulled up from 14th at take-off to third place at the finish, coming in at 169 m.p.h. behind Ron Paine and P. Q. Reiss, who were flying a Hawk Trainer and a Tiger Moth respectively.

For last year's *Daily Express* Air Race from Hurn to Herne Bay, Nat had metal airscrews fitted to the Gemini in place of the former wooden ones, but found that the engines were running 250 r.p.m. down. The lower speed which resulted set him back quite a long way. He was scratch man in his weight class, and had to give four minutes to Jimmie Rush, who, as it happened, was flying considerably faster. As far as Folkestone Nat pressed on; but by then much of the field had passed him, so, rather than cane the engines all the way to Herne Bay, his discretion caused him to abandon the race and he put down at Lympne.

This year, until the *Daily Express* Race on September 22nd, Nat was unable to race at all. In April he went up to Wolverhampton to collect the Gemini, whence it had been flown by Ron Paine for its C. of A. While flying it back, Nat felt an acute ache in his shoulder and neck. With increasing pain, and in a half-dazed condition, he flew the Gemini down to Elstree (where it is normally kept) and next day thought he had better see the M.O. After X-rays and so on a ruptured spinal disc was discovered, and Nat was confined to bed for seven weeks; for four of them he was encased in plaster.

This was a great disapopintment, not only to him but for the rest of the Throttle-Benders and racing pilots generally, for Nat is a keen sportsman, and his inevitable withdrawal from the races was sincerely regretted. He had entered for the King's Cup and the Norton-Griffiths, which were due to be flown at Hatfield on June 23rd, and it is typical of him that he would not scratch his entry for either contest until the day before.

At one time, when in hospital, Nat thought he might not be able to race, or even fly, any more. Fortunately, medical science has succeeded and he was able to go to Hatfield to watch what proved to be the cancellation of the National Air Races. He is now flying again, although still not 100 per cent fit. He was ready to fly in the *Daily Express* race on August Bank Holiday when the weather ("like a Satrap prorogueing a Sanhedrim") again stepped in and took control. But when the race (the only big one this year) was in fact flown on September 22nd, he flew the Gemini in it. At Shoreham Airport he was 54th to leave out of a field of 60; and he gave nearly 55 min to the limit man and was only 22 min ahead of Jeffrey Quill in the Spitfire 22 at scratch.

Nat got more speed out of the Gemini than it has ever done—173 m.p.h. But the handicappers know the T.B.U. by now, and he finished well back! As always, Nat enjoyed the race. In fact, remembering his exciting neck-and-neck dual with Fred Dunkerley's Cirrus-Gemini along the course, he regards it as the best race in which he has competed.

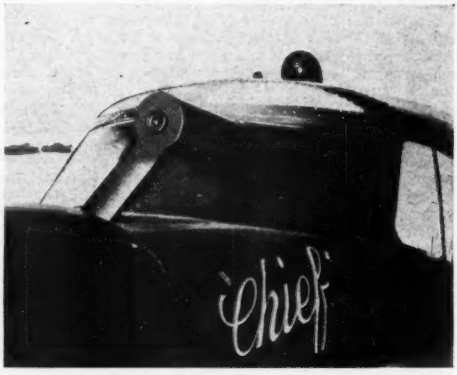
PERISCOPIC PILOTAGE

SOME experiments which may well have an important bearing on the design of future high-speed aircraft, and particularly on any in which the prone pilot-position is used, have recently been conducted at the University of Illinois. As a by-product, so to speak, certain results which have emerged during the course of the work may also have an ultimate influence on orthodox blind-flying techniques.

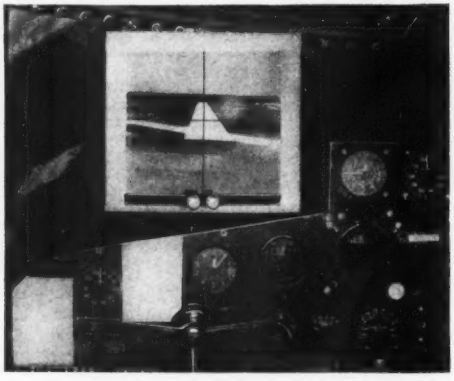
The research, which is based on the use of periscopic or television presentation in place of the pilot's direct view through his windshield, is being conducted by Dr. Stanley N. Roscoe, of the University's psychology department. The project is being financed by the Office of Naval Research.

To determine the optimum size of the presentation screen, and whether the image should be magnified, Dr. Roscoe installed a periscope in a Cessna T-50 of the University's aircraft fleet, and covered the blind-flying instruments and windows so that the pilot had to depend on the periscopic image for information about the attitude of his aircraft and what was ahead of him. (It should be noted that, although the term "periscope" is used in the report which has reached us from America, one of the accompanying illustrations suggests that "projection telescope" might be a more accurate optical description.)

The pilot could tell his relation to the horizon and the outside world only by looking at an 8in-square screen. For tests of screen-size the picture was blocked off to various dimensions down to 2in square; the periscope optical system allowed for various degrees of magnification.



Not a secret weapon, but the optical-projection apparatus installed in a Cessna T-50 for the experiments.



An approach to the runway as seen on the screen. Magnification of the view was found to be misleading.

Eleven pilots of the University's staff flew the aircraft both with and without the windows covered, and with various screen sizes and image magnifications. They flew an instrument-flight procedure, involving turns, climbing, and gliding.

Results showed that with the 8in screen, and low magnification giving a wide angle of outside visibility, a pilot could fly "just about as well" as with windshield vision. Smaller screens made the task difficult. Considerable magnification was not deemed desirable, because it increased the apparent rate of any changes in the aircraft attitude and thereby confused the pilot in his handling.

It was suggested for I.F.R. flying, when neither the optical system nor television could provide a view ahead, a coloured conventional presentation could be projected on the screen and actuated by a gyro-device to move in exactly the same way as a direct image. This would give the pilot a horizon and other visual reference-points needed to handle his craft.

Dr. Roscoe thinks that the same idea may be valuable in redesigning the normal artificial horizon. The present orthodox type of instrument he describes as "small and unrealistic."

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THE VAMPIRE'S LAIR

BY definition the Vampire is "an accursed body which cannot rest in the kindly earth, but nightly leaves its grave to suck the blood of sleeping men." Such a sinister character is dramatically conveyed by this *Flight* study of a D.H. Vampire Mk 52 of the Royal Norwegian Air Force at its pine-screened dispersal point during Exercise Counter Thrust, described last week. The affinity is the more striking in that these aircraft, with R.A.F. machines of similar type, flew a number of successful night sorties against the opposing "Blueland" forces.

HAWKER P.1067

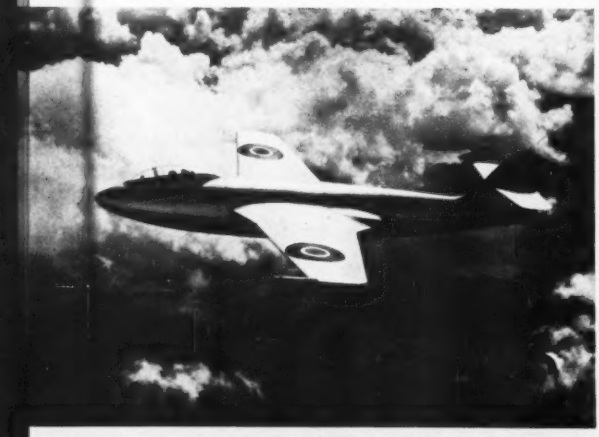
A Pictorial Appreciation of a New Avon-powered Transonic Intercepter Fighter Ordered in Quantity for R.A.F. Re-equipment

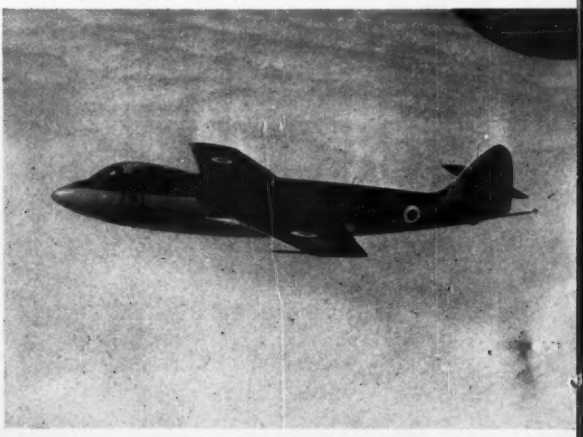
The Brains

IN presenting this feature on Hawker's new fighter we had hoped to include, as well as the machine, the men behind it; but the retiring nature so characteristic of the scientist and technician has asserted itself to such an extent that the team responsible (led, of course, by Mr. Sydney Camm, C.B.E., F.R.Ae.S.) prefer to remain pictorially anonymous, especially so in view of the difficulty of selecting for portraiture a comparative few of the many involved. We can, however, name those chiefly concerned. They are: R. H. Chaplin, O.B.E., B.Sc., F.R.Ae.S.; J. V. Stanbury, A.R.Ae.S.; F. Cross, A.F.R.Ae.S.; H. Tuffen; J. Barrett, A.M.I.Mech.E., A.F.R.Ae.S.; H. E. J. Rochefort, Whit.Sch., A.C.G.I., D.I.C., A.M.I.Mech.E., A.F.R.Ae.S.; C. P. Plantin, B.Sc., A.F.R.Ae.S.; W. Weetman, A.F.R.Ae.S.; S. Fairey, B.Sc., A.M.I. Struct.E.; T. Wake; P. W. Wreford-Bush, A.F.R.Ae.S.; R. B. Marsh, A.F.R.Ae.S.; J. D. Stranks, A.F.R.Ae.S.

The Breed

The family tree of the P.1067 can be traced back through a distinguished line of piston-engined and jet fighters. Depicted here in comparative views are the designs to which it is most closely related: at upper left is the P.1040, Hawker's first jet; upper right, the carrier-borne Sea Hawk; lower left, the swept-wing P.1052; lower right, the "all-swept" P.1081.





Photographed by Cyril Peckham from the same viewpoint as its progenitors opposite, the P.1067 is seen to be characterized by a relatively slimmer fuselage and a "spine" extending between the cockpit and fin. Readers who were not fortunate enough to attend the S.B.A.C. Display may care to know that this very beautiful new fighter is finished in a glossy pale green of the shade sometimes known as "duck-egg blue."

The Product

"THE cold facts are that England demonstrated the finest jet fighter and jet bomber operating in the world today."

To dispel any doubt concerning this eulogium upon the recent S.B.A.C. Display, it must be explained that its origin is not to be found in any organ of the British technical or popular Press, nor in any particularly well disposed Commonwealth journal; it is, in fact, from the *New York Herald Tribune*, and in quoting it we are not inclined to dissent.

The fighter in question, of course, is the Hawker P.1067, powered with a Rolls-Royce Avon and demonstrated with shattering effect by Neville Duke, chief test pilot to Hawker Aircraft, Ltd. Performance figures are steadfastly withheld, but there is no reason to doubt that Duke exceeded by a substantial margin the official world record speed of 670.981 m.p.h. now standing to the credit of that excellent, though none too heavily armed, American fighter the North American F-86, or Sabre.

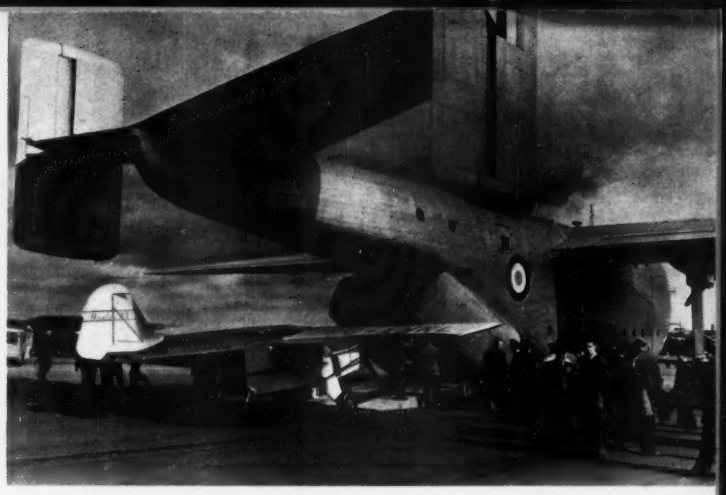
What is, perhaps, not generally known is that the 1067 was flying at Farnborough precisely in the form in which it left Hawker's experimental shop, and that Duke had put up a similar aerobatic performance on his third flight in the new prototype.

The impact of the 1067 on the flying world recalls the advent of the Hurricane some sixteen years ago. Together with the Spitfire that immortal fighter set a new standard in performance, and mounted the unprecedented armament of eight machine guns. If, as it is not unreasonable to hope, the fire power of the P.1067 proves to have been commensurately augmented, the congratulations already received by the Hawker team will assuredly be redoubled.

The Proving

S/L. Neville Duke, D.S.O., D.F.C., and two Bars, A.F.C., Czech M.C., A.R.Ae.S., chief test pilot, Hawker Aircraft, Ltd., who made the first flight of the P.1067 on July 20th this year at Boscombe Down.

Resisting any inclination to use the "dignity and impudence" cliché, we offer the picture on the right as a telling comparison between Britain's largest and smallest air freighters. In the view below it will be noted that the B.4's tail boom extends only a short distance beyond the hold, and that the wheelbase is longer than might be supposed.



PYGMY PANTECHNICON

Preliminary Notes on the New Auster B.4 with Cirrus Bombardier Engine

IF ever a light aircraft looked as though it could do a host of useful jobs—military, agricultural, commercial and private—it is the Auster B.4 ambulance-freighter, seen for the first time at Farnborough. A fair amount of information has already been made available regarding construction and performance, and, as mentioned recently, the Editor has been able to take a ride in the B.4. For a "work-horse" aircraft, it is not unattractive in appearance, and it retains the simplicity of its earlier stablemates, though it does exhibit several innovations. In particular, the new large main wheels, similar to those fitted to the Model S, will be welcomed by potential operators abroad. The carrying capacity and ease of loading have previously been found only in aircraft of twice the size.

The B.4 is of fabric-covered, all-metal construction except for the main spars, which are of specially protected wood. Several years' experience in the tropics with wood so treated has shown it to be entirely satisfactory, so the constructors feel that buyers abroad need have no worries on this score. The prototype rear-door-cum-tail-fairing is also of wood, but a termite-baffling metal structure could, we understand, be supplied without difficulty. The two rear wheels, which could (and may) be made steerable, carry no more weight than does the single tailwheel of, say, the Aiglet, and early experience on wet grass fields has indicated no abnormal tendency to sink in.

Of the engine—the new Blackburn Bombardier—it may be said that performance is very good (though idling was a little rough on the prototype B.4), and the unit is expected to go into production to meet military orders in the near future. The makers of the aircraft would be prepared to fit an American engine to suit foreign buyers, but this would entail orders for perhaps a dozen to justify the cost involved, and the engines would have to be supplied, or paid for in dollars.

Deliveries and price of the B.4 will depend to a great extent upon possible military orders, and in this connection it is learned that the aircraft is to be tried out during the forthcoming Army manœuvres on Salisbury Plain.

Following our brief flying experience of the B.4, we can state that it is unexpectedly comfortable as well as roomy, the view out is first-class, and the noise, except at full throttle, is less than would be expected. For this flight the stretchers had been removed and the alternative bench-type rear seat (in two sections) fitted. The faired rear door had been removed entirely so one could look over the back of the seat into space. Surprisingly, however, there was no draught or discomfort.

Performance on the 180 h.p. of the Bombardier is lively and climb good. The estimated 100 m.p.h. cruising speed is likely to be exceeded but in any case should be adequate for the type and range—though, of course, a little more speed is always welcome. Small fields will be well within the

The undercarriage arrangements of the B.4 are completely new to Auster aircraft. The tail-cone has been jettisoned (with the aid of a lever above the hinges on the starboard topside) and the two-section bench-type rear seat has been bolted in position instead of the two stretchers—one above the other—which are an alternative load.

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PYGMY PANTECHNICON . . .

aircraft's operating capabilities. With Aeromatic (Hordern Richmond) airscrew, as fitted to the Model S, or with the more powerful American Continental engine, the performance should move into the exceptional category.

To those who appreciate functional simplicity and practical economy, the jeep-like khaki colour scheme and the control layout will both have special appeal. The flap lever remains port high, as on other Austers, but the elevator trimmer is now lever-operated on the instrument panel—the radio half of which may be glimpsed in one of the illustrations on the previous page.

Other references and illustrations have appeared on pages 398, 404 and 428 of recent issues. Principal dimensions and data on the B.4 are given in the adjacent column.

Dimensions

Span	37ft
Length	24ft 8in
Wing area	189.75 sq ft
Max. total weight	2,600 lb
Volume of usable space within fuselage	110 cu ft
Dimensions of rear cargo door	36in x 38.5in
Max. length of cargo space with rear door fitted	13ft

Performance at Full Load

Payload for max. range	550 lb
Range	300 miles
Take-off	190/200 yd
Cruising	100 m.p.h.
Rate of climb	600 ft/min

Estimated Performance with 190/213 h.p. Continental Engine

Max. total weight	2,700 lb
Payload for max. range	570 lb
Range	300 miles
Alternative range	420 miles
Take-off	170/180 yd
Cruising	105 m.p.h.
Rate of climb	700 ft/min

FOR INSTRUMENTATION RECORDING

WHAT may be described as "continuous intermittent" recording of instrument-readings by a ciné camera is now an accepted technique in aircraft research and test work, both on the ground and in the air.

In this connection there is considerable interest in the new Vinten light instrumentation camera illustrated here, especially in view of the fact that compactness and low weight have been kept in the forefront of the design. Standard 35 mm perforated ciné film is used, loaded into interchangeable magazines. Each magazine will hold up to 200ft (60 metres), giving 3,200 separate exposures.

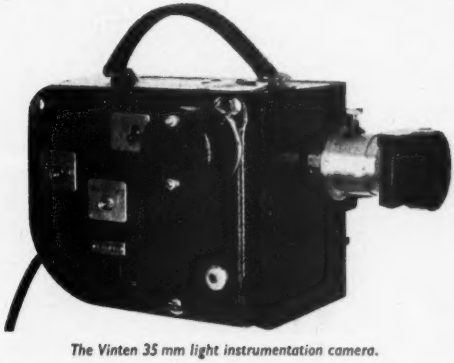
The optical system consists of a single lens mounted in a removable panel, and extra lenses, in their individual panels, can be supplied. A square-form focusing thread allows the full scale to be accommodated within one turn and the rotary shutter is adjustable in 10 deg increments to a maximum of 165 deg. Provision is made for a sun-hood and filter.

Setting-up is by viewing through the film gate, thus eliminating the possibility of parallax error.

The film transport mechanism has been designed for very slow running. Except for the intermittent motion the camera conforms to normal ciné design, the film being pulled out of the magazine by a control sprocket, passed into the gate and then taken from the gate and returned to the magazine by the lower section of the same sprocket. The intermittent motion utilizes an eccentric beater roller to pull the film down by the correct amount for the next exposure. A reset footage counter measures the amount of film exposed.

Two 12-volt motor driving units are supplied, each having an on-off control switch and a speed selector. Two fuses are fitted, both on the same pole, but with a selector switch to allow instant change-over and uninterrupted operation in the event of one burning out.

The normal-speed unit is adjusted to run at 8, 16, or 24 pictures per second simply by movement of the selector switch, and speed changes can be made while the camera is running. The low-speed unit is designed to run the camera at one, two and four pictures per second. The selector switch gives a choice of two speeds, but by changing a pair of gears the range can be extended to a third speed. The speeds which this system makes available are one and two pictures per second on gears "B" and two and four on gears "A".



The Vinten 35 mm light instrumentation camera.

The camera, with one drive mounted ready for use, weighs 13¾ lb (6 kg). The complete equipment, consisting of the camera, two driving units, and two magazines, in carrying cases, weighs 44 lb (20 kg). Overall dimensions of the camera are: Length, 11in; width, 8in; height, 8in. W. Vinten, Ltd., North Circular Road, London N.W.2, are the makers.

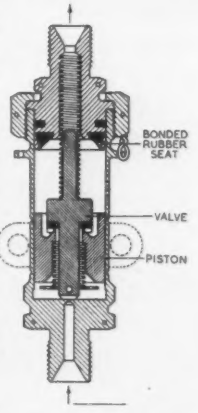
HYDRAULIC-SYSTEM SAFEGUARD

A USEFUL contribution to aircraft safety is represented by a new hydraulic pressure relay produced by Dunlop. The relay is a compact safety device for insertion in pipe-runs serving remote single-line components such as pressure gauges and switches. Its purpose is automatically to prevent the total loss of fluid from the main system if failure of the subsidiary line or component should result in a leak.

Constructionally, the relay consists of a stainless-steel cylinder provided at one end with an integral pipe connection. The opposite, open, end of the cylinder accommodates a counter-bored brass head sealed by a rubber ring and retained by a sleeve nut.

A similar integral pipe connection is machined on the head, and the inner mouth of the counterbore is lipped by an annular rubber seat bonded to the metal of the head. A tubular aluminium-bronze piston, closely fitting but free to slide in the cylinder bore, is formed with a central raised valve seat, and carries a double-stemmed rubber-seated valve.

The valve is restrained upon the seat in the piston, which encircles its lower stem; and a second spring, loaded beneath the head and located upon the upper valve stem, loads the piston towards the base of the cylinder.



Dunlop's new hydraulic pressure relay.

If the relay and subsidiary line are correctly primed with fluid, the piston and valve together function as a separator when the main system pressure is applied. In so doing, they move up the cylinder, expel a small volume of fluid, and consequently generate an equivalent pressure in the subsidiary line.

If, owing to leakage, the pressure existing above the piston and valve is released, they are lifted to the top of the cylinder by the force of the main-system pressure. The shoulder of the valve then seats on the rubber insert in the head, and prevents the escape of fluid from the main system. The relay is stated to be suitable for use with vegetable or mineral base fluids at working pressures up to a maximum of 5,000 lb/sq in. (Dunlop Aviation Division, Holbrook Lane, Foleshill, Coventry.)

FOR USE IN EMERGENCY

The R.F.D. Range of Aircraft Dinghies: Features for Crew Safety and Protection

The general appearance of the R.F.D. ten-person Universal Life Raft may be seen in the above view, together with the rain-water well, lifelines, ladder and, beneath the surface, one of the stabilizing buckets.

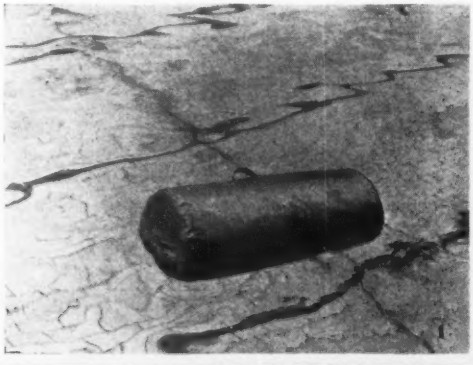
PROBABLY because it rates lower in news value than new aircraft and armaments, rescue and survival gear for personnel inevitably receives less publicity than do the more spectacular developments of the rearmament programme. Nevertheless, the vital need for such equipment has not gone unrecognized either in the U.S.A. or in this country. Here, development is in the very capable hands of such bodies as the R.A.F. Institute of Aviation Medicine (an article on whose activities appeared in *Flight* of January 25th, 1951), the R.N. Medical School and the School of Safety Equipment and Survival Training. Several firms in the "ancillary" industry are also playing an important part in this work, and among them is the R.F.D. Co., Ltd., who are one of the oldest-established manufacturers of flotation gear.

We recently had an opportunity of seeing production of this firm's Universal Life Rafts at its Godalming, Surrey, factory. It might, incidentally, be observed that life-rafts are by no means the only R.F.D. product. For instance, the firm has developed very successful winged gunnery targets for towing by aircraft; there is the "Portobel" ground installation for gunnery training (a popular exhibit demonstrated at last year's S.B.A.C. show); and R.F.D. have for many years been specialists in kite balloon manufacture, their current production in this line being devoted to balloons for paratroop-training.

The life rafts have been called "universal" because of their ability to be adapted to a variety of uses. For instance, they have been found to be as much at home in the Arctic Circle (as a foundation of an igloo) as they are in heavy seas. These dinghies are produced in three sizes, accommodating six, ten and 20 persons respectively (outside diameters of 7ft 3½in, 8ft 8½in and 12ft 2½in). Originally the ten- and 20-seat types were made to the order of the R.C.A.F., but after subsequent inquiries from other sources the six-person raft was also developed.

The design of the three types is identical, consisting basically of two superimposed, independent horizontal pneumatic chambers of "air ring" shape, made of three-ply rubber-proofed cotton fabric. The plies are sandwiched with their weaves running in opposing directions, in order to guard against tearing by jagged objects. Forming a diaphragm to the lower ring is the double floor, the upper and lower skins of which are connected by a series of webs that serve to maintain its shape. This double floor is itself inflatable, the separate chambers formed by the webs communicat-

This sequence, photographed during a test in a swimming-bath, shows the automatic inflation of the 20-person dinghy as it would occur after ejection from a "ditched" aircraft. The CO_2 used for inflation is released from the cylinder visible in the third photograph.



FOR USE IN EMERGENCY . . .

ing with one another. The method of inflation is dealt with in a subsequent paragraph.

A third important feature is the covering canopy, which is supported by four arched air-tubes branching from the upper hull ring and connected at their apex by a small top ring. The upper hull ring, the arches and the top ring are thus all inflatable from the same source. A fabric diaphragm fitted to the lower face of the top ring provides a suitable vessel for collecting rain-water. Two diametrically opposed entrances ensure easy access to the interior and may be closed by hook-and-eye fasteners from the inside, thereby giving maximum protection against wind, rain or spray. Zipp fasteners are not fitted, because of the risk of ice rendering them inoperative.

To counter any tendency towards capsizing in heavy seas—especially when a full complement is not on board, fabric bucket-type stabilizers are fitted around the periphery below the water-line, and fill automatically when the raft is immersed.

The installation of the Universal Life Raft in an aircraft depends upon whether the valise or "blow-out" system of launching is to be employed. The valise is suitably positioned near an aircraft exit and, in an emergency, is thrown out manually under the restraint of a static line, which trips a spring-loaded plunger and releases CO_2 gas from a cylinder connected by piping to the two hull rings.

The blow-out launching system, on the other hand, implies the stowage of the dinghy beneath a fuselage panel or wing panel automatically jettisonable under pressure from within. Pulling a line (or, alternatively, pressing a button) releases the gas and causes inflation and consequent ejection of the dinghy. Alternately, initiation of the action may be by an immersion-switch, which operates when the aircraft itself is ditched.

In general, the blow-out system is considered preferable to the valise method, since the process of launching the valise from the aircraft entrance may cause temporary obstruction. Suitable provision has been made in the design of the cylinder-operating valve to prevent accidental inflation under increased gas pressure in tropical conditions.

The inflatable floor does not share the CO_2 supply, but is filled by air provided from accordion-type bellows operated by the crew when they are aboard.

Each dinghy is well provided with ancillary equipment, the standard scale being as follows :—

Per Aircraft.—1 dinghy radio ("Gibson Girl").

Per Dinghy.—1 first-aid outfit; 24 distress signals (two-star red); 1 signal-type torch; 1 heliograph; 8 Fluroscine sea-markers; 1 Walter radar reflector; 1 plastic whistle; 1 magnetic compass.

Per Person.—1 emergency flying ration; 1 16-oz tin of water; 2 desalting units (4½ pints).

AVIATORS' CERTIFICATES

BELOW is another of the periodical lists of those who have qualified for Royal Aero Club Aviators' Certificates, covering the period from July 26th, 1951, to August 16th, 1951. The previous list (June 25th to July 26th) appeared in *Flight* of August 17th last.

No.	Name	Club or School	Date
27,396	E. A. M. Soper ...	Qualified Service pilot	26.7.51
27,397	I. D. Brinson ...	Cardiff Aero Club	26.7.51
27,398	C. R. Cuthill ...	Qualified Service pilot	26.7.51
27,399	R. R. Kennedy ...	Qualified Service pilot	26.7.51
27,400	J. G. F. Hewitt ...	R.A.F., Cranwell	26.7.51
27,401	R. R. Martin	R.A.F., Cranwell	26.7.51
27,402	C. D. Sharpe	R.A.F., Cranwell	26.7.51
27,403	R. Dick	R.A.F., Cranwell	26.7.51
27,404	D. Sturgeon	Ards Aero Club	26.7.51
27,405	P. H. Filmer-Sankey ...	West London Aero Club	26.7.51
27,406	P. Skinner	Herts and Essex Aero Club ...	30.7.51
27,407	M. M. Stechler ...	Spalding Aero Club	30.7.51
27,408	K. C. Imlah	Qualified Service pilot	30.7.51
27,409	D. T. Simmonds ...	Cardiff Aeroplane Club	30.7.51
27,410	R. B. Metcalfe ...	Coventry Aero Club	30.7.51
27,411	A. G. McN. Hurley ...	Cardiff Aeroplane Club	30.7.51
27,412	D. MacD. B. Carnegie	London Aeroplane Club	30.7.51
27,413	G. T. Jarman	Qualified Service pilot	30.7.51
27,414	C. A. Harris	Qualified Service pilot	30.7.51
27,415	J. L. Bush	Qualified Service pilot	30.7.51
27,416	G. A. Coatesworth ...	R.A.F., Cranwell	30.7.51
27,417	J. Cunningham ...	Wolverhampton Aero Club ...	31.7.51
27,418	W. B. Lee-Emery ...	Elstree Flying Club	7.8.51
27,419	E. W. Anstead ...	Cambridge Aero Club	7.8.51
27,420	E. K. Edwards ...	Wolverhampton Aero Club ...	7.8.51
27,421	A. M. Norman ...	Danham Aero Club	7.8.51
27,422	G. N. Alexander ...	Strathtay Aero Club	7.8.51
27,423	R. B. Taylor	Strathtay Aero Club	7.8.51
27,424	E. F. Norris	York Flying Club	7.8.51
27,425	G. N. Woolf	Southend Flying School	7.8.51
27,426	D. I. Brown	Strathtay Aero Club	7.8.51
27,427	R. M. I. Dare ...	Exeter Aero Club	7.8.51
27,428	H. E. McClain ...	Danham Flying School	7.8.51
27,429	A. O. Sharples ...	Qualified Service pilot	7.8.51
27,430	G. A. Bolton	Qualified Service pilot	7.8.51
27,431	P. C. Stevens ...	Airways Aero Club	7.8.51
27,432	R. A. Lockwood ...	Lancashire Aero Club	7.8.51
27,433	F. A. Allanson ...	Plymouth and District Aero Club	7.8.51
27,434	N. H. Giffin	R.A.F. Cranwell	7.8.51
27,435	J. Cooper	Qualified Service pilot	7.8.51
27,436	J. G. Towle	No. 9 Reserve	7.8.51
27,437	T. A. A. M. Van der As	Herts and Essex Aero Club ...	10.8.51
27,438	D. Mundell	Qualified Service pilot	13.8.51
27,439	J. M. Porter	Nottingham University Air Squadron	7.8.51
27,440	K. Howard	Qualified Service pilot	7.8.51
27,441	A. O. Pullman ...	Qualified Service pilot	7.8.51
27,442	R. B. Beckley ...	Qualified Service pilot	7.8.51
27,443	R. E. Titmus	Qualified Service pilot	7.8.51
27,444	J. M. Burry	Qualified Service pilot	7.8.51
27,445	T. F. Copleston ...	Qualified Service pilot	7.8.51
27,446	P. D. A. Austin ...	Qualified Service pilot	7.8.51
27,447	D. E. Gilbert ...	Qualified Service pilot	7.8.51
27,448	D. M. Thomas ...	Wiltshire School of Flying ...	7.8.51
27,449	P. A. Smith	No. 7 F.T.S., Cottesmore ...	8.8.51
27,450	F. A. Bieri	Southend Flying Club	7.8.51
27,451	M. Coulson	West Riding Aviation Centre ...	13.8.51
27,452	C. N. Sworder ...	Qualified Service pilot	13.8.51
27,453	T. Goeritz	Redhill Flying Club	13.8.51
27,454	P. R. Lockwood ...	Christchurch Aero Club	13.8.51
27,455	B. R. Corley	Herts and Essex Aero Club ...	13.8.51
27,456	J. D. Engerran ...	Redhill Flying Club	13.8.51
27,457	E. S. Thomas	Wolverhampton Aero Club ...	13.8.51
27,458	P. N. Farley	Qualified Service pilot	13.8.51
27,459	D. C. Baird	St. Andrews University Air Squadron	13.8.51
27,460	L. Smith	Qualified Service pilot	13.8.51
27,461	K. D. Malfacree ...	Qualified Service pilot	13.8.51
27,462	D. K. Clarke	Northants Aero Club	13.8.51
27,463	W. J. Watt	Airways Aero Club	14.8.51
27,464	P. S. Anderson ...	Qualified Service pilot	16.8.51
27,465	M. D. Reece	Hampshire Aeroplane Club ...	16.8.51
27,466	A. P. Jeyes	Northamptonshire Aero Club ...	16.8.51
27,467	C. C. Voller	Herts and Essex Aero Club ...	16.8.51
27,468	P. B. Wills	Qualified Service pilot	16.8.51
27,469	J. B. Perkins	Qualified Service pilot	16.8.51

INSTRUMENTAL: Perpetuating a name already well known in connection with aircraft-instrument servicing and supply, a new company has recently been formed with the title of Wynstruments, Ltd. Above is seen their small but attractive H.Q. at Staverton Airfield, Gloucester, and the interior view shows the hospital-like calibration room. The firm is equipped for the overhaul, test and certification of all instruments except autopilots; test equipment includes apparatus developed by the R.A.E. Inspection is A.R.B.-approved, and A.I.D. approval is expected shortly.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

International Astronautics

IN your September 14th note on the recent London Congress on Astronautics you expressed the views that the achievement of space flight would cost millions, that only governments could afford to sponsor such a project, and that "no government is likely to overload its exchequer without the compulsion of a military aim."

With all of these opinions, as a true statement of the present situation, I am in complete agreement. I do not, for example, dissent in any way from the view that the main current expenditure of our Western governments must be on defence. (If it is not, then the question of any subsequent expenditure on astronautics may remain purely academic for a long time to come; from the purely astronautical viewpoint, it is no more than a happy coincidence that such a programme still makes a large, if indirect, contribution towards our ultimate objective.)

However, I should be grateful for a little of your space in which to register a protest against the facile belief that large expenditures on (for example) astronautics will *always* be unlikely "without the compulsion of a military aim."

It is all a question of the standard of values accepted, at a given period, by mankind. In the past, earlier cultures have variously put their main effort into art, religious practices and architecture, preparations for a dubious after-life (as exemplified by the Pyramids), and so on. We of the twentieth century concentrate on the development, manufacture, and employment of technically advanced means for mutual destruction. . . .

Is it too much to hope that one day we may be civilized? After all, exploration and the search for new knowledge and experience have always rated a high priority in man's activity. On this basis, the full mastery of his powers of flight, leading eventually and inevitably to flight beyond the atmosphere and to other worlds, is seen to be an end worthwhile in itself. The "compulsion" involved goes far deeper than any merely military or commercial consideration.

Furthermore, while such an effort would undoubtedly be very costly, its expense would still be only a small fraction of that demanded by modern war, when measured in terms of either money or human life.

London, N.W.3. A. V. CLEAVER.

Those Big, Bold Roundels

SINCE, in two recent issues, you drew attention to the "new large roundels" of "unusual size" on the upper wing-surfaces of the P.1067, I have had to suffer taunts *ad nauseum* about "coupled flying saucers," "is another world watching us?" "visible in all views," etc. I think it is only fair that you should know, in my own self-defence, that the roundels in question are in full accord with A.P. 970, Chap. 108. Hence, may I claim justifiably, unlike Little Willie, to be the only one in step?

Kingston-on-Thames. P. B. D.

Admiralty and Coastal Command

I READ with interest the article in your issue of August 3rd by "Icarus". While I am not in complete agreement with him I do feel that there is a good case for the transfer of at least a part of Coastal Command to the Admiralty. Mr. W. N. Cumming, in his letter appearing in your issue of August 24th, brings out all the old arguments against this, but his reasoning is hard to follow, and I fear his statements are not altogether accurate.

Taking a reasonable view, the protection of shipping on the high seas is a naval commitment. The protection of convoys by carrier aircraft has proved successful, as demonstrated in the last war. The inclusion of air escort carriers in any convoy was always greeted with great enthusiasm by all who sailed in the convoy.

It is, however, desirable to provide additional air cover, particularly under certain weather conditions, with land-based long- and very-long-range flying boats and landplanes, which are provided by Coastal Command. There is surely a good case for these aircraft to be transferred to the Admiralty, as their tactical use is purely naval.

They would then have the advantage of trained naval crews having experience in surface escort as well as in air escort and having a practical understanding of a seaman's problems.

It might also encourage the development of long-range flying boats, which the Royal Air Force seem most reluctant to undertake.

Toronto, Canada. J. B. B. D. PAUL.

A Veteran-aircraft Club?

DURING this year I have taken part in certain of the larger flying events with an ancient Avro Avian, and I have derived a great deal of pleasure from the enthusiasm and helpfulness shown by other owners of vintage aircraft.

From this experience springs the thought that the formation of a Vintage Aeroplane Club would serve to bring this happy band together.

The difficulties of keeping an obsolete aircraft going are increasing, and a central pool of information concerning spares and facilities would be invaluable, while a voluntary panel of technical advisers would do much to iron out difficulties at C. of A. time.

I envisage restricting full membership to owners of aircraft registered say, in or before 1934 and still holding a current C. of A. An annual rally of such enthusiasts might well become a feature of the flying calendar.

Motoring and motor cycling fans have their vintage clubs to keep alive, in a practical way, the spirit of the early days, and I think that aviation now has a past worth preserving. I am interested to know just what support such an idea will provoke, and I shall be very grateful if some of your readers can let me have their views on the subject.

Denham, Bucks. R. E. GILLMAN.

Facing Which Way?

ON balance, Mr. B. J. L. Haimes (September 21st) comes down in favour of backward-facing seats. In his attempt to be entirely objective, however, and uninfluenced by the sentimentality of humanitarian considerations, he advances a number of old arguments against backward-facing seats which cannot be allowed to pass unchallenged. For example, he says that when an aircraft falls vertically, ground-loops, somersaults, or disintegrates, the advantages of backward-facing seats appear to be nullified. As has been pointed out repeatedly, there was a case recently when a Hastings fitted with backward seats nose-dived into the ground and somersaulted over on to its back, all the passengers surviving with only slight injuries—which appears to dispose of two of these objections. The value of backward-facing seats in cases of ground-looping or disintegration can also be shown.

A ground-loop tends to throw a passenger forwards as well as sideways in relation to the nose of the aircraft, and the backward-facing seat therefore still has advantages, as there is usually a residual component of forward motion, even in a swing of this description. On disintegration, the back of a passenger's seat would still be there to protect him as he and the seat continue to move on at the speed of the aircraft when it broke up. No protection is provided in either case by *forward*-facing seats, however.

If seats pile up in the front of an aircraft the passengers facing forward will be thrown bodily against the seats in front of them and the seats behind will then descend on top of them. In the first case they will probably sustain crushed-in skulls, whether or not their lap-straps hold them, and, in the second case, crushed-in torsos. Facing backwards, however, their heads and bodies would still be protected, especially if seats were designed with side head-rests and arm-rests designed to take the shock of telescoping.

The chaining of seats to the main structural floor members, or "anchoring" by wire stays (or similar means of restraint capable of standing strains in all directions), would surely ensure that seats do not move relative to the floor just as well as the heavy structural reinforcement Mr. Haimes fears might be necessary.

The argument that any aircraft operator who adopts backward seats is "clearly assuming his aircraft may crash" is inconsistent when applied to backward seats only, and is typical of the ostrich-like outlook of operators. It is inconsistent because all operators provide straps which passengers have to fasten on landing and taking off—an unpleasant reminder of the hazards involved. It is ostrich-like because all passengers *know* aircraft crash and they can only be reassured, rather than alarmed, at the adoption of any precautions to increase their security. (Ship operators might as well plead that lifebelts and lifeboats are alarming!)

Even with shoulder-straps, an occupant of a forward-facing seat is likely to be thrown over or under his straps, but with only lap-straps of the passenger type (useless in forward-facing seats) a passenger is held securely in his seat in a backward-facing seat.

Mr. Haimes asks for facts. In the 1947 U.S.A.F. Air Transport Command Traffic Division Report it was shown that in 607 cases

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Hawker Sea Fury and Sea Hawk production. Photographs by courtesy of Hawker Aircraft Ltd.

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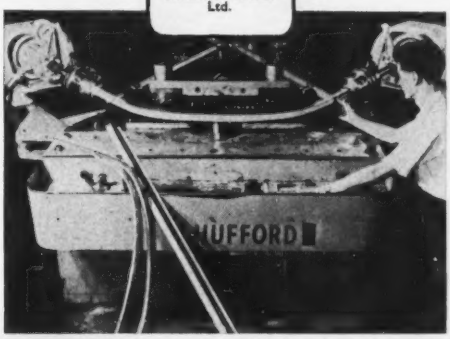

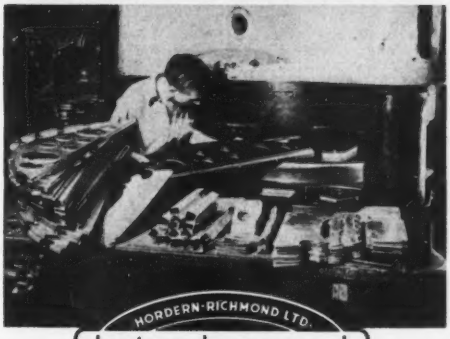

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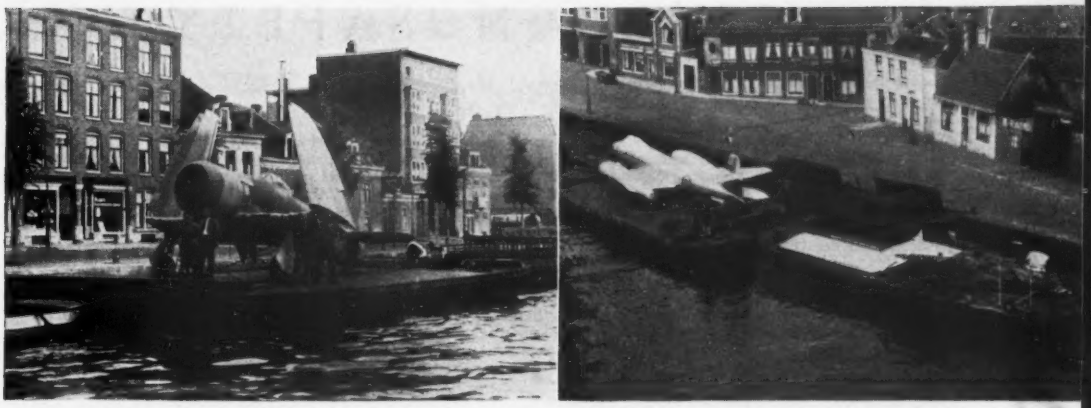

A Sea Fury, a Mk 8 Meteor and an historic Fokker travel from factory to airfield by unconventional means (see letter, below, from A. N. Uiterwijk, Jr.).

CORRESPONDENCE . . .

of fatal burns and injuries only 13 were due primarily to fire. More than 500 of 544 deaths (in 245 accidents) were due to crushing of head and trunk. Of 1,020 passengers of all kinds, 896 favoured backward seats, 918 found no ill-effects when flying in them, 792 found visibility improved, and 959 thought them safer.

A corollary to the report recommends that passenger accommodation be placed as far rearwards as possible, since passengers in the waist were found to have seven times more chance of survival in crashes than those forward of the wing. The importance of adequate escape exits in both size (minimum of 18in square recommended) and number was stressed. (To this I would add the need for flexible fuel tanks and high-flash-point fuel, adequate fire-extinguishing automatic equipment, and fireproof bulkheads between the forward and aft compartments.)

The report sums up by saying that the weight of scientific opinion is solid on providing backward seats and unanimous it would save hundreds of lives.

Good design can greatly increase passenger safety, as pointed out by Mr. W. Tye, C.T.O. for A.R.B., in an address to the R.Ae.S., April 23rd, 1948, in which he said that 12g lap-straps, or backward seats with headrests, would save many lives.

In conclusion, did I not read somewhere that the United States had evolved a removable or occasional type of rearward-facing seat for troop transport aircraft which would stand up to 14g? I cannot advance this as a fact, since my memory may be at fault, but if this is so it would seem there should be little difficulty in dealing with ordinary passenger seats of a more permanent and similar character.

East Twickenham, Middlesex. D. HORNSEY.

Half-appropriate

FURTHER to recent correspondence on "Unhappy Designations," the registration of a certain British aircraft for export seems worth quoting. A Percival Prince, it bears the letters PP-NBG. A poor advertisement for such a fine little machine.

Luton Airport. EAGLE OBSERVER.

[The Brazilian registration "PP" is apt for a Percival Prince, at any rate. And probably the rest will not mean much in Brazil!—ED.]

Unfair to Draughtsmen

THE S.B.A.C. Farnborough Show has once again provided an event of outstanding interest. I wonder, however, whether the general public realize that a large percentage of those most actively concerned with the design of modern aircraft have no facilities afforded to them for an appreciation of this event.

I refer to the aircraft design draughtsman, the man who, faced with a blank sheet of paper on his board and a set of "loads" from the stress office, is required to think out a preliminary scheme for, shall we say, a mainplane spar frame for a heavy bomber, or even a set of "lines" for its fuselage.

It seems amazing to me that some of the leading aircraft firms of the country offer no facilities on the four private days of the Show and that their technicians must attend on the general public days when no aircraft are open to inspection other than from outside the ropes.

Kent. TORQUE TUBE.

Water-borne

HEREWITH I send you two real Dutch photographs, one of a Fokker-built Gloster Meteor Mk 8 and a Fokker "Spin" (Spider), the plane in which Fokker himself learnt flying. It is not the original aircraft, but a copy of it built some years ago. The other picture shows a Fokker-built Hawker Sea Fury. In both photographs the aircraft were being transported to Schiphol Airport.

The Meteors are now being built at Schiphol, in the new Fokker works, so they are no longer shipped by barge. When I left Holland towards the end of August the Sea Furies were still being built at the old Fokker works in Amsterdam North. They are making 24 of them for the Dutch Navy.

Downend, Bristol. A. N. UITERWIJK, JR.

Farnborough Firework

PROBABLY it is already inevitable that Zurakowski's remarkable new aerobatic evolution should be known for ever after as a "cartwheel." Nevertheless, I should like to stake my claim for "Catherine wheel," for surely the Meteor was being propelled about its axis by one eccentric jet, exactly as in the familiar firework.

Portsmouth. D. S.

FORTHCOMING EVENTS

Oct.	6.	Helicopter Association: "Design and Construction of Rotor Blades" (all-day meeting).
Oct.	10.	Royal United Service Institution: "H.M.S. *Theseus* in the Korean War, and Some Special Problems of Naval Aviation in that Theatre," by Capt. A. S. Bolt, D.S.O., D.S.C., R.N.
Oct.	13.	Aerauto Association (College of Aeronautical and Automobile Engineering, Chelsea): Annual Dinner.
Oct. 21-28.		Aero Club of Algeria: Tour of Algeria.
Oct.	24.	R.Ae.C.: Jubilee Ball.
Oct.	24.	Royal Air Force College, Cranwell: Rugby v. Oxford University Greyhounds (away).
Oct.	30.	Society of Instrument Technology: "Materials for Instrument Manufacture," by E. B. Moss.
Oct.	31.	Royal Air Force College, Cranwell: Boxing v. Oxford University (away).
Nov.	3.	Royal Air Force College, Cranwell: Fencing v. Cambridge University (home).
Nov.	14.	Royal Air Force College, Cranwell: Rugby v. R.A.F. XV (home).
Nov.	23.	Helicopter Association: "The Giant Helicopter," by O. L. L. Fitzwilliams, B.A.
Nov.	24.	Society of Licensed Aircraft Engineers: Main Lecture: "Functioning of a Manufacturer's Servicing School," by D. W. Richardson, M.B.E., A.F.R.Ae.S.
Nov.	27.	Society of Instrument Technology: "Visual Presentation," by K. F. H. Murrell, M.A., F.R.P.S.
Dec.	5.	Royal United Service Institution: "The War in Korea, with Special Reference to the Difficulties of Using our Air Power," by W/C. P. G. Wykeham-Barnes, D.S.O., O.B.E., D.F.C., A.F.C.
Dec.	21.	Institute of Navigation: "Meteorology and Navigation," by Lt. Cdr. P. G. Satow, D.S.C., R.N.
Jan.	18.	Institute of Navigation: "Navigational Errors," by W/C. E. W. Anderson, O.B.E., D.F.C., A.F.C.
Jan.	29.	Society of Instrument Technology: "Mechanical Consideration in the Design of Servo Systems," by Prof. A. Tustin.
Feb.	15.	Institute of Navigation: "Navigation Aids for Military Aircraft," by S/L. D. Bower.
Feb.	23.	Society of Licensed Aircraft Engineers: Main Lecture: "Some of the Responsibilities and Problems of an Airworthiness Authority," by R. E. Hardingham, O.B.E., F.R.Ae.S., M.S.L.A.E.

BUILT-IN SAFETY

A Plea for Imagination in Design: Mr. J. Lederer's R.Ae.S.-I.Ae.S. Lecture

A LECTURE entirely devoted to the subject of safety is an unusual event in the aeronautical world. Because of this, perhaps, the paper *Infusion of Safety into Aeronautical Engineering Curricula*, given before the Third Anglo-American Conference at Brighton by Mr. Jerome Lederer, Director of the Guggenheim Aviation Safety Centre at Cornell University, gained in emphasis. A summary follows.

In his introductory remarks, Mr. Lederer said that although design engineers were well versed in the basic sciences, the oversights and mistakes made during their learning periods had cost thousands of lives and millions of dollars. The object of this paper was to indicate how the gap that existed between theory and practice might be overcome at university level with a minimum interference in the essential engineering curricula.

Dealing with design errors, the lecturer suggested that the most prominent cause had been inexperience and that, in the past, these errors might have been avoided if engineers had been imbued with a greater awareness of safety principles. Even where "know-how" had existed, it was common to find a distant attitude toward safety, while several responsible aeronautical engineers had declared publicly that safety was not a prime consideration when matched against performance. This callous attitude towards safety had often been influenced and supported by economic considerations, and the pressure of competition, based on performance, had also been an important factor in defeating the aims of safety. However, it was recognised in the aviation industry that air safety and reliability did have economic values which could no longer be overlooked.

Safety Through Experience

On the subject of safety attained through experience, the lecturer thought that self-interest, financial considerations and ethical attitude should persuade engineers that safety was sufficiently important to arouse and maintain their concern for it, and that these factors should be brought to the attention of student aeronautical engineers early in (and should be maintained throughout) their college training. In the normal course of their employment they would learn about safety from their own mistakes or from the mistakes of others, but they could not rely only on experience to obtain such learning in full measure. Training by experience was important but haphazard, and was achieved at the expense of the public.

No expert or group of experts, however wise and qualified, was omniscient enough to foresee all possibilities of trouble, of malfunctioning and of accidents that would result from a new design or rearrangement of an old one. A logical approach to this problem would be to derive principles based on experience and to put them at the disposal of the engineer. These principles would not prevent all the errors but, at least, they would make the engineer think systematically with regard to safety and reliability. The engineer would need to remember fewer facts, and because the system for scenting trouble was comparatively new in aviation, he would have the added interest of being able to contribute to its development.

Mr. Lederer, speaking of repetition of design errors, gave an example of an aircraft which, in 1938, crashed due to the pilot's microphone lodging between the control column and the floor—an accident that killed all on board. Eight years later a similar error was made in a new aircraft built by a different company, re-creating the same hazard. Further, in the five years 1946 to 1950 inclusive, the airlines of the United States had alone suffered nine fatal accidents due to oversights in design. Five of these nine accidents involved scheduled passenger-carrying operations and resulted in the killing of 169 passengers—about 25 per cent of all passengers killed in this period. The situation was therefore serious.

The lecturer thought that although it would be presumptuous to suggest principles of safe design, a beginning should nevertheless be made, if for no other reason than that others could either build upon it or tear it down and, in doing so establish a science of accident prevention in aviation. Five broad principles were offered for consideration :—

(1) Parts or components of the aircraft other than the basic structure should be designed to "fail safe." This meant that failure would not create additional or cumulative hazards. For example, if the blade of the airscrew were to break loose, it should not sever the oxygen system in the fuselage or any system essential for control of the aircraft. To make an intelligent analysis of a design from the standpoint of "Does it fail safe," the engineer should know why parts were likely to fail. The causes of failure such as corrosion, fatigue, vibration, etc., were usually treated at considerable length in regulations and design manuals.

(2) The structure and its components should be designed to encounter with safety the impact of objects, the rough handling by men and the effects of natural phenomena which were likely to be met in service.

(3) Procedures for adequate maintenance and operating practices established by the designer should be consistent with average human effort, ability and attitude. (Mr. Lederer instanced an example in which a ground engineer had reversed the connections to an altimeter as a result of the parts being hidden behind the instrument panel).

(4) The aircraft and its components should be protected against the effects of normally inadvertent or uncontrollable human errors or carelessness. The lecturer further quoted an instance where a small bolt, dropped by an engineer, lodged in the elevator chain-and-sprocket system, causing the loss of the aircraft and its crew of six.

These four principles were intended to prevent accidents from occurring as a result of oversights in design.

(5) The aircraft should be designed to give the occupants reasonable assurance of protection in accidents which could be considered as survivable. There was little excuse for weak safety-belt attachments, for sharp-edged seat backs that split the skull of the passenger behind, or for fire extinguishers or food containers which broke loose and hurtled like flying missiles.

These five principles were intended to assist the student engineer to classify accident prevention knowledge as he came upon it, and to furnish a basis for thinking on safety problems. They should be supported by access to specific instances, frequently provided, of actual accidents or near accidents caused by oversights in design. A course in human engineering should also be established in aeronautical curricula in order to afford study of the mechanism of the average man in relation to the design of the machine which he was required to operate.

INTRODUCTION TO SUPERSONICS

"Aerodynamics of Supersonic Flight," by Alan Pope. Sir Isaac Pitman and Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Illustrated. Price 25s.

THE author, Alan Pope of the Daniel Guggenheim School of Aeronautics, Georgia Institute of Technology, states that his purpose is to introduce students to the field of supersonics and to help them to decide whether or not they would like to proceed with a more advanced course at a higher level. This well-illustrated text-book—which, of necessity, requires a knowledge of calculus and elementary aerodynamics—appears to fulfil the author's wish admirably, and it should leave no doubt in the student's mind either of the basic elements of supersonics or of his decision to pursue the matter further. Its general plan corresponds to that of the same publishers' elementary books on practical aerodynamics and it reviews, in a semi-narrative form, phenomena which are usually illustrated only by means of their mathematical development. Emphasis has, in general, been placed upon the practical application by the inclusion of specimen examples, together with suitable lists of references.

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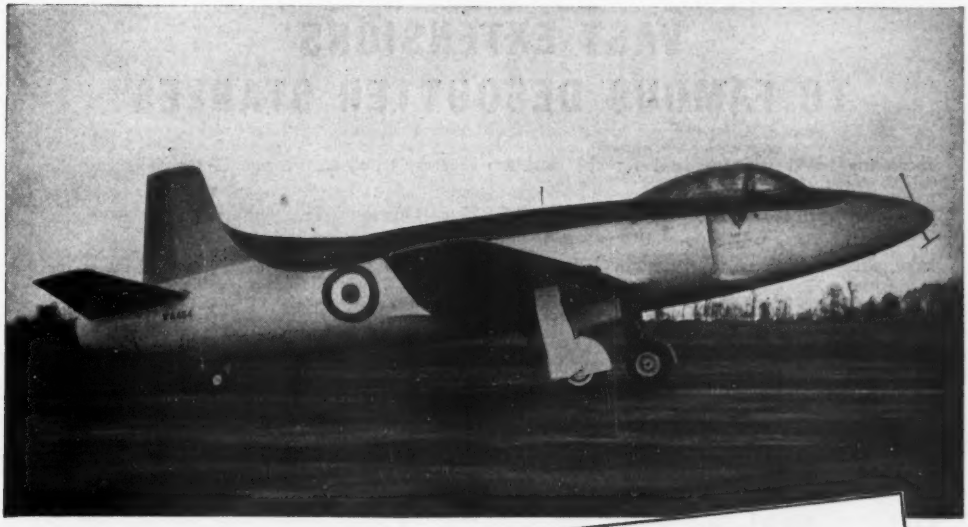

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• • •

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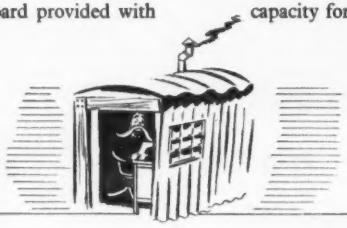

than six famous glasses and twelve infamous bottles. Long corridors now extend in all directions and a great air of importance is created by crowds of excited employees rushing rapidly in all directions trying to locate Incoming Orders, Typists Pool, Progress Upwards, Foreign Despatch or just the Usual Offices. The Stationery and Advertising Department is now handsomely housed under the stairs, while the brain of the whole vast enterprise — Design and Research — has been fitted with barred windows and a swinging trapeze.

Our representative was privileged to follow an Incoming Order down several corridors and on to various ingenious charts and graphs until it finally disappeared into a heap on the Sales Manager's new steel Incoming Orders Tray.

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CIVIL AVIATION

APPEARANCE of aircraft, as typified here by a smartly turned-out B.O.A.C. Hermes in full livery, is but one of the many aspects of airline operation in which the aid of the modern industrial designer is enlisted.

AIR TRANSPORT AND INDUSTRIAL DESIGN

THE application of industrial-design techniques to the manufacture and operation of civil airliners was discussed in two papers delivered before the 1951 Design Congress (held at the Royal College of Arts in London on September 19th/20th) by two well-known airline executives. They were Mr. C. H. Jackson, B.Sc., D.I.C., of B.O.A.C., and Dr. Albert Plesman, of K.L.M. We reproduce their papers in summarized form.

Mr. Jackson, by way of introduction, said that industrial design was often regarded as an issue of sales and public relations rather than one of engineering policy, and that this was particularly true in civil aviation. He described the particular problems of design in this industry and the considerations, both technical and commercial, by which the designer is bounded.

Since, he said, the product sold by B.O.A.C. was somewhat intangible compared with any manufactured article, the application of industrial design could not readily be classified and centralized. B.O.A.C.'s "products" were "a seat and a journey" for which the customers' primary requirements were comfort and good service together with "the nearest approach to the Euclidian simplicity of the shortest, and cheapest, distance between two points."

Since international agreements had eliminated most competition by price, companies competed mainly on reliability of schedule keeping, effectiveness of advertising and efficiency, and the general attractiveness of passenger service. In such a situation, good industrial design could be an almost decisive competitive factor.

Describing the evolution of design policy, Mr. Jackson pointed out that one of B.O.A.C.'s most important problems had been to find a consistent design-style which could identify the Corporation at all points of contact with the general public and the individual passenger. He explained that B.O.A.C. had only a limited control over the design of aircraft and little or no say in the design of airports. Its most direct influence lay in aircraft details and ancillaries such as coaches and baggage trolleys, booking facilities, advertising procedures and personal accessories for passengers.

The development of an all-pervading design theme had not been easy or rapid. A mixed bag of aircraft and uncertainty over the lines of development of both traffic and types of aircraft—these were some of the initial difficulties which faced B.O.A.C. One of the Corporation's early moves had been to seek the advice of several well-known industrial designers who, working together with the management, set the basis for a standard colour scheme which had evolved into the well-known blue, white and gold which the airline now used. They had also given advice on equipment and articles carried in cabins, while ranges of uniforms had been devised for use by aircrews and ground staff in various climates. Standard designs had been developed for furniture and public equipment in booking centres and, finally, a search had been made for the right type of passenger chairs and cabin fitments.

Coaches were the passenger's first transport link with B.O.A.C. in England and at many overseas stations. They were much in the public eye, and therefore had to be well designed. The Corporation's coaches had the same basic colour scheme as the aircraft, so as to emphasize the continuity of transport and also to simplify the purchase and storage of finishing materials.

Technical Factors: Mr. Jackson pointed out that, so far as new aircraft were concerned, intricate problems of engineering and design had to be discussed between maker and operator. In many ways, he said, the aircraft industry has the last word on industrial design; not only because it presented to the operator and the public an aircraft with the superb lines of, for example, the Comet, but because these lines were derived primarily from technical considerations which also limited the scope of industrial design within the aircraft. In the same way, cabin dimensions had to be balanced against aerodynamic drag (and, therefore, speed and range), against structural weight and even against engine power and reliability. The same considerations applied to the design and layout of sections; even the toilets and galleys—with their considerable loads of equipment and water—had generally to be located according to the requirements of longitudinal trim. There was no simple formula for the designer who was forced to take many technical factors into account and might even be called upon to revise his ideas after the first flight trials.

The speaker continued: "After the first technical compromises had been made there still remained a mixture of commercial and technical considerations which controlled the precise location of seats and many features of the interior appearance. For instance, there were maximum and minimum limits on the leg and elbow room allowed to passengers. It was only after all such points had been considered that the task of designing the interior of an aircraft became clear. Essentially, it was to obtain the desired appearance in equipment that was functionally correct and properly arranged in all the passenger quarters. The appeal to passengers must be made without adverse effect on weight or on ease of access for routine maintenance."

Mr. Jackson explained also that, because weight was so critical

COMFORT, allied with efficiency and economy, has also to be achieved with regard to cabin seating arrangements. In the Comet, as this photograph clearly shows, the industrial designers have excelled themselves.

CIVIL AVIATION . . .

a factor in aircraft design, B.O.A.C. and the aircraft manufacturers were continually looking for upholstery materials that were light, proof against flames and tropical vermin, capable of absorbing sound but not water, durable, washable, and suitable for simple mounting and dismounting for repair.

The Corporation, he said, relied considerably on colour in its efforts to achieve an appearance of warmth and spaciousness. Lighting was important, too, for under varying conditions of operation the shades used for colouring could be critical not only of the appearance of the cabin but also of women passengers' complexions.

Chairs and Interiors: As the overall design effects would be observed mainly from the passenger's chair, which was almost the centre of his world for the duration of the flight; this item had to be pleasant to look at and comfortable to relax in, with amenities such as paper stowage, reading light, ash-tray and the steward's call-bell correctly, yet unobtrusively positioned.

Good interior design of aircraft, both in general and in detail, could not be produced with assurance straight from the design drawings. Hence—and particularly for civil aircraft—the aircraft industry had developed to a high degree the use of relatively cheap, quickly made and full-scale mock-ups in wood, paper and cardboard. In them the layout, furnishings and operation of the interior could be examined, modified and finally approved by the purchaser. But even with these techniques, he continued, the designer's limits were so close that final approval of every detail could be given only after inspection of, and flight in, the first fully furnished aircraft.

External Colour Schemes: The last stage in aircraft design was the external colour scheme and exterior markings. These, at least, were entirely in the operator's hands, and were subjects to which they could apply their own requirements, including the white cabin tops. B.O.A.C. also controlled directly the little things which, carried in the aircraft, added to the interest of the journey. These included cutlery; specially designed crockery and drinking ware (which can only be fashioned after proper time and motion studies in the aircraft); the gay menu cards and souvenir certificates, the folder of route maps, note paper and cards, and pamphlets. Each had to keep the passenger content in his chair, but each must serve a useful purpose. The whole of this range called for imaginative and practical design.

Dr. Plesman's Lecture

DR. PLESMAN said that industrial design meant more than "the mere aesthetic or commercial frills sometimes employed to give one's product a pleasant shape or appearance." It should be rooted not merely in the organization of industrial firms but in the nation's culture as a whole. The first half of this century displayed amazing technological progress, but this was a restless development without any lasting style. By consciously promoting good industrial design we could help to shape the character of present-day society and give our century a face and a soul.

K.L.M., he said, was founded soon after the first post-war civil aircraft exhibition in 1919, the success of which was largely due to the aptitude of its architect who subsequently built K.L.M.'s head office, as well as many booking offices. In 1920 no aircraft had been specially built for civil aviation and converted war machines were chartered. Not till 1921 did K.L.M. first use its own aircraft, and even then did its utmost to achieve a pleasant interior. During the next fourteen years 12 different types were put into operation, one of them winning first prize at the Paris Show for the best interior decoration. Since 1935 K.L.M. had used standardized American material, limiting its own design influence to colour schemes: but now that aircraft were getting bigger and bigger it could again influence their interiors.

The speaker then described how K.L.M. had concerned itself with good design in the building of its booking offices throughout the world—also its board rooms, canteens, offices, hangars, workshops and rest-houses. "We exercise," he said, "a great deal of taste in our publicity—in posters, advertisements, presents and medals—and even in sculpture on our building." The company spends some £650,000 a year on making it known that K.L.M. stands for "fast and comfortable transportation."

Dr. Plesman then emphasized how important it was to see that the inspiration of the pioneers was infused to-day into a much bigger organization of 11,000 employees. A genuine industrial design policy was not something that could be limited to a section of the personnel, nor was it solely a weapon in the hands of a commercial department pursuing a limited objective.

The result of a sound industrial design policy could not easily be measured in currency, but K.L.M. had come to feel that it did pay. Apart from commerce, too little attention was given to the influence that art could have upon man. On this wider plane the speaker concluded his remarks.

COMMONWEALTH JET PROBLEMS

MORE than 100 delegates from all parts of the British Commonwealth met in London last week to examine in detail some of the problems of air-traffic control, ground organization, and other technical matters which are expected to arise when turbine-powered aircraft are brought into regular service on Empire routes. Held at the Royal Empire Society Hall, Northumberland Avenue, London, W.C.2, the conference opened on September 25th, and is due to end today, October 5th. The delegates were welcomed by the Permanent Secretary to the M.C.A., Sir Arnold Overton.

In his speech, he said that the use of jet aircraft on Commonwealth routes would be of immense value in preparing for their introduction on other trunk services. Aircraft such as the Comet had many attractions to offer the passenger in the way of high cruising speeds and their implicit reduction in passenger-fatigue, and reduced noise and vibration levels. In order to consolidate such an advance, it was necessary that accurate decisions should be made promptly, both on the ground and in the air. Thus the reliability of traffic control, meteorological and communication systems became even more important than at present, for otherwise payloads would have to be sacrificed.

During the afternoon of the opening day, A/Cdre. Sir Frank Whittle gave an explanatory lecture, illustrated by slides and a film, on gas-turbine propulsion. Commenting on the current airline scene, Sir Frank thought that during the next five years, air traffic throughout the world would probably be doubled and, in some areas, trebled. There were indications, he said, that the main traffic would be over stage-lengths of under 1,000 miles, and there must be not only high speed, but high service-frequency. He thought it was unfortunate that an aircraft such as the Brabazon was not designed for short stage-lengths, as this would have eased the traffic-control problem.

He stressed that due advantage must be taken of the jet aircraft's ability to get off the ground quickly. Its pre-take-off check could be completed within three minutes, and it was important that it should not be delayed at holding positions on the perimeter.

In general, he thought that the traffic-control problem tended to be over-stressed. It was, nevertheless, important, he said, that the incidence of "random arrivals" should be drastically reduced, if not eliminated. Such delays, he thought, were often due to "mental indigestion" on the part of the controller who was attempting to handle four or five aircraft at the same time.

Sir Frank said that, during his recent tour of airports which the Comet is likely to use when it goes into regular service, he had found that by far the greatest deficiency at present was the lack of information on high-altitude weather. This presented "a most depressing picture." There were rarely route forecasts for heights above 20,000ft, and little was known about high-altitude airstreams which, being often of considerable velocity, could be of great assistance in reducing fuel consumption over given stage-lengths if the optimum height at which to fly were known before take-off.

He quoted one instance of upper winds at Nicosia, Cyprus, which were discovered by radio sonde to have a velocity of 250 m.p.h. at 40,000ft. Sir Frank expressed the opinion that there was a pressing need for a world-wide international meteorological organization which could be responsible to some such organization as I.C.A.O.

After the opening day, the remainder of the conference was held in closed session.

COMET "STACKING" TRIALS

AS an essential part of its precision timing trials before being introduced on B.O.A.C. routes this year, the Comet recently carried out a two-hour holding procedure over the Epsom radio range and the inner holding stack at a time when London Airport was experiencing a fairly heavy flow of traffic. The Comet was brought down from its cruising height and operated to within one minute of its scheduled time. It finally left the range after two hours' flying at various altitudes.

The trials, which proved fully satisfactory, are designed to prove that high-speed turbine-powered aircraft are capable of being accurately controlled in time and space, and can thus be readily fitted into the traffic patterns at international terminals such as London.

It has now been announced, incidentally, that later versions of B.O.A.C.'s Comets are to be fitted with Ekco airborne search radar. The unit has a high-frequency beam, scanning through an angle of 75 deg/sec. The searcher can be used in both the horizontal and vertical planes so that, when not employed to give early warning of approaching storm-filled clouds, it can be used as an automatic map reader. From 40,000 to 50,000 ft it is claimed that a ship 25 miles away can be picked up on the screen, while a small dinghy can be seen when five to six miles distant. The complete installation weighs about 175 lb.

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CIVIL AVIATION . . .

B.E.A. INCREASED FARES

BECAUSE of the rising cost of operation, B.E.A., together with several foreign airlines operating parallel routes between Britain and the Continent, will increase many of its fares from October 16th. The increases will apply both to normal and excursion rates. For example, the normal return fare from London to Paris will now be £15 6s instead of £14 and the off-peak excursion rate will be £12 instead of £11. Other new return fares (shown with present rates in parentheses) will be as follows: Rome, £58 10s (£57 12s); Barcelona, £43 8s (£39 7s); Berlin, £42 6s (£39 7s); Geneva, £29 9s (£28 9s); Milan, £49 3s (£47 16s).

Excursion fares on certain routes in addition to the Paris run will also be advanced. There will, however, be a number of concessions which will, to some extent, offset the greater cost of travel. Return tickets on Continental routes will remain valid for a year instead of—as at present—only six months. On U.K. internal services the 12-month validity period began on October 1st. In addition, the age limits on students' tickets will be extended to their 26th birthday instead of their 21st.

B.E.A.'s announcement, incidentally, coincides with one by Aer Lingus to the effect that, from October 21st, there will be substantial fare *reductions* on all routes. In some cases, notably the Birmingham-Glasgow route, the rates will be the lowest ever charged. The actual decreases range from 3½ per cent on the Dublin-Amsterdam service, to 11 per cent on the Liverpool route. Tickets will be valid for 17 days, and the new fares are: Dublin to London, £9 18s; Liverpool, £5 12s; Manchester, £5 19s; Birmingham, £7 13s; Bristol, £8 14s; Glasgow, £6 15s; and Amsterdam, £22 4s. There will be no change in the Dublin-Isle of Man, Shannon and Paris rates. Thus, day travel on the Dublin-London route will now be actually cheaper than on the summer "Starflight" services. Aer Lingus is also intending to increase frequencies considerably to accommodate the greater volume of traffic which is expected. There will also be new freighter services to Glasgow, Birmingham and Liverpool.

EUROPEAN AIR TRAFFIC MEETING

A. CDRE. W. E. G. MANN, C.B.E., D.F.C., M.I.E.E., the M.C.A.'s director-general of navigational services, is to lead a U.K. delegation, which will include representatives from the Admiralty, Air Ministry and the airline corporations, to a special I.C.A.O. meeting called to discuss the co-ordination of air traffic in Western Europe. The meeting will take place in Paris on October 8th, and its main function will be to examine the difficulties created by the existing and the prospective flows of traffic in certain parts of Western Europe, with particular attention being paid to those areas in which extensive civil and military operations take place side by side. The conference is to be attended by representatives of all European states concerned with these traffic control problems.

FILIAL FORMATION: Just before setting out on their delivery flight to Yugoslavia, these two pilots of Jugoslovenski Aerotransport happily displayed their newly acquired Short Sealands in close proximity to a third machine flown by one of the manufacturers' test pilots. The two J.A. aircraft will be used on domestic services along the Dalmatian coast.

BREVITIES

AIR services between Holland and Australia, which were broken off during the last war, will shortly be resumed as the result of an agreement which was signed between the two governments in Canberra, Australia, last week.

* * *

Under arrangements made with I.C.A.O., International Aeradio, Ltd., will provide three instructors to run courses in radio communications (operations and maintenance) and air-traffic control at Karachi, for personnel of the Pakistan Department of Civil Aviation.

* * *

Mr. H. A. L. Patterson, C.B.E., known to thousands of international air passengers as the manager of Gander Airport, Newfoundland, has now been appointed Canadian representative to the I.C.A.O. Air Navigation Commission based at Montreal. Mr. Patterson will succeed Mr. Stuart Graham, who is now serving as civil aviation adviser to the Ethiopian government.

* * *

At a cost of 35 million dollars (about £12,500,000), American Airlines have bought 30 aircraft from the Douglas Aircraft Corporation for delivery in 1953. The order includes 24 52-passenger DC-6Bs and six DC-6A freighters, each capable of lifting up to 27,000 lb of cargo. When this equipment has been delivered, A.A. will have increased their total seating capacity by 37 per cent and will have doubled their total cargo capacity.

* * *

It is reported from Sydney that American interests acting on behalf of the Japanese Government may soon ask Britain to grant permission for Japanese aircraft to use Kai Tak (Hong Kong) and the municipal airport at Singapore as reciprocal rights for the landings which B.O.A.C. aircraft now make at Tokyo on services *via* Okinawa. Australia will also be faced with a similar request in return for Japanese permission to Q.E.A. to land at Iwakuni and Haneda.

* * *

B.E.A. are reported to have shown interest in the idea of converting the Homes and Gardens Exhibition at the South Bank Festival site for use as a passenger arrival and departure station. Being centrally located, with adequate space for passenger coaches to drive in and out, it has obvious advantages over the Corporation's present London terminal in Kensington High Street. The London County Council are also known to have shown sympathy with the idea.

* * *

The transport of freight by regular airlines to Australasia, the Far East and the East Indies, is now almost at a standstill as a result of the current fuel shortage. Nor can charter aircraft any longer be of assistance on these routes, because they cannot obtain aviation spirit east of Bahrein. According to brokers' reports, the accumulation of cargo for eastern destinations is colossal, and no further bookings can be accepted. Even the alternative western routes *via* North America, New Zealand and Australia are out of the question because of the vast quantities of cargo which have accumulated at the trans-shipment points of Vancouver and San Francisco.

* * *

The M.C.A. has now decided to put into effect the recommendation, contained in the Brabazon Report on landings and take-offs in bad weather, that weather minima should be expressed in terms of runway visual range and critical height for landing, and in terms of runway visual range and cloud ceiling for take-off. It will continue to remain the operator's responsibility to establish weather minima for the use of his pilots, but, under the terms of the amended Article 17 of the Air Navigation Order, 1949, operators will in future be required to notify the Minister of such minima and of any changes in their values which may subsequently be made.

* * *

On his return from the recent I.A.T.A. meeting in London, Mr. W. Hudson Fysh, chairman and managing director of Q.E.A., said in Sydney last week that Australia would have to order aircraft in proportion to her overseas routes if she intended to remain on a competitive basis. Mr. Fysh mentioned that there is at present a severe world shortage of aircraft for international air transport. Referring to the D.H. Comet, in which Qantas is known to be interested, Mr. Fysh thought that the first Mk. II (powered by Avons) would probably be test-flown towards the middle of next year. B.O.A.C. would eventually use this type on the England-Australia route. Although, said Mr. Fysh, this machine would greatly reduce the flying time between the two countries, it would have a very limited capacity for freight and mail and would probably still have to be supplemented by aircraft such as the Constellation.

FROM ALL QUARTERS

R. N. Dorey's New Post

A MEMBER of the Rolls-Royce organization very well known in the aircraft world—Mr. R. N. Dorey, O.B.E., B.Sc., F.R.Ae.S.—has been appointed general manager of the Company's car division. The increasing commitments of this section of the business, says an official statement, has necessitated changes in the administration, and Mr. Dorey is also to act as deputy to Dr. Llewellyn Smith, a director of Rolls-Royce, Ltd., and chief executive of the car division, while Mr. S. H. Grylls becomes chief engineer.

Mr. R. N. Dorey

Mr. Dorey joined the company in 1927 as an experimental engineer and in 1931 he inaugurated its flight development establishment. More recently he has directed the development of the Tay turbojet and the Dart turboprop. In the development of the former he worked in close collaboration with the engineers of Pratt and Whitney, who produce this unit in the United States under the designation J-48, and later with Hispano Suiza, who manufacture the Tay in France.

The Farnborough Traffic-Jams

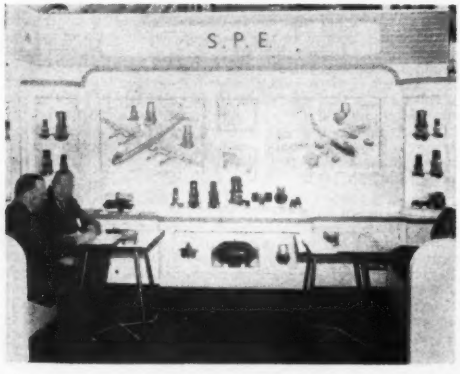
LAST week we published several letters from readers who complained of the delays experienced in entering and leaving Farnborough Airfield on the final day of the S.B.A.C. Flying Display. We also made brief reference to a letter in *The Times*, in which Mr. E. C. Bowyer, director of the S.B.A.C., explained some of the factors which led to the congestion.

The Society feel that this letter—which was written in reply to one from Lord Jessel—also constitutes an effective answer to the criticisms put forward by our own readers, and they have accordingly asked us to quote it in full. This we do gladly :—

"Sir,—No one regrets more than the Society of British Aircraft Constructors the discomfort suffered by Lord Jessel—and by many others—in getting away from our display at Farnborough last Sunday evening. After investigation and comparison with other open-air events which attract large crowds, we cannot, however, accept his contention that what happened showed lack of organization and foresight.

"Arrival of cars at an event like the S.B.A.C. display lasts over many hours. On Sunday cars began to arrive before 9 a.m. and were still arriving eight hours later. There was a record attendance, approaching double that of the corresponding day in 1950, and the roads also had to carry the Sunday traffic between London and the coast. Because of the heavy rain that began to fall immediately flying ended the great majority naturally tried to get away at once. Some 10,000 cars, 5,000 motor-cycles, 2,000 pedal cycles, 500 coaches, and about 50,000 pedestrians were involved in a rush to get home. Many motorists sought, naturally enough, to manoeuvre to their best individual advantage, frequently against the advice of the car park attendants, and delays were thereby aggravated

"Every reasonable visitor must surely have expected some delay in his journey home from such a popular event. Flying ended at 5.30 p.m. The exhibition was closed at 7 p.m. Bearing those times and the exceptionally bad weather in mind, the achievement of the car park contractors, the local police, and the other authorities concerned in clearing one main car park by 8.45 p.m., the coach park by 9.20 p.m., and seeing off the last car by 9.50 p.m., was a not unworthy one. Lord Jessel may be assured that the society is not complacent. We are giving the closest study to the lessons of the 1951 display to see whether additional steps can be taken to facilitate arrival and departure of public traffic at future displays. The points which he and others who have written direct to the society have raised will greatly assist us.—Yours faithfully, E. C. Bowyer, Director, Society of British Aircraft Constructors, Limited."



KNOW-HOW AT THE SHOW: With background drawings showing their locations in the Viscount and the Canberra, the actual pump units were displayed, among others, in sectioned and whole form on the Self-Priming Pump and Engineering Company's stand at Farnborough.

NEW ZEALANDERS VISIT FILTON: Seen on the Brabazon's flight-deck are (left to right) Mr. T. A. Barrow (secretary, N.Z. Air Board), Mr. W. R. Farnes (Bristol aircraft sales manager), W/C. Bray (R.N.Z.A.F. London H.Q.), Mr. G. N. Roberts (general manager, Tasman Empire Airways), and Mr. A. E. Russell (Bristol director and chief designer).

Synthetic Adhesives Summer School

AN end-of-course dinner held at the Dorothy Café, Cambridge, on September 28th, marked the successful conclusion of a summer school devoted entirely to the specialized subject of synthetic resin adhesives and glueing techniques. The course was sponsored by Aero Research, Ltd., in collaboration with St. Catherine's College. With the announcement in April that such a course would be available, it was anticipated that between 50 and 80 visitors would need accommodation; in actual fact the response from industry and research establishments, both in this country and abroad, was so large that no fewer than 150 students attended the course. Most European nationalities were among the fourteen countries represented and two of the visitors from the British Commonwealth came from so far afield as Australia and New Zealand.

Preliminary inquiries had shown that interests were divided roughly into two main groups; those representing the woodworking industries and those from engineering, electrical manufacturing and allied concerns. Course No. 1, therefore, was designed to suit members of plywood, furniture, sports goods and vehicle-body-concerns, while Course No. 2 dealt with a much wider field and covered such industries as aircraft, radio, rubber, brake linings and plastics. Even with this division it was not possible to complete the course in less than a week, which, it was felt, was the maximum time for which key personnel could be absent from their occupation without unnecessary inconvenience.

Demonstrations in Course No. 2 covered items of interest which have direct application to aircraft constructional problems. Among such items were methods of applying pressure (the autoclave, vacuum technique and hot press), comparisons of strength between riveted, spot-welded and bonded joints, the use of cold-setting "Araldite" resins, and the bonding of aircraft panels with "Redux"—to mention only a few. The final item in the time-table was a "brains trust" at which collective questions were discussed and appropriately dealt with.

The guest of honour at the dinner, Professor J. F. Baker, O.B.E., of the Department of Engineering, Cambridge University, in replying to Dr. N. A. de Bruyne (managing director, Aero Research, Ltd.) reviewed the work of the University and mentioned the forthcoming post-graduate course, "Structures and Materials," which starts shortly.

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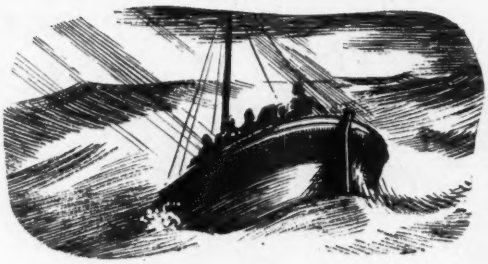

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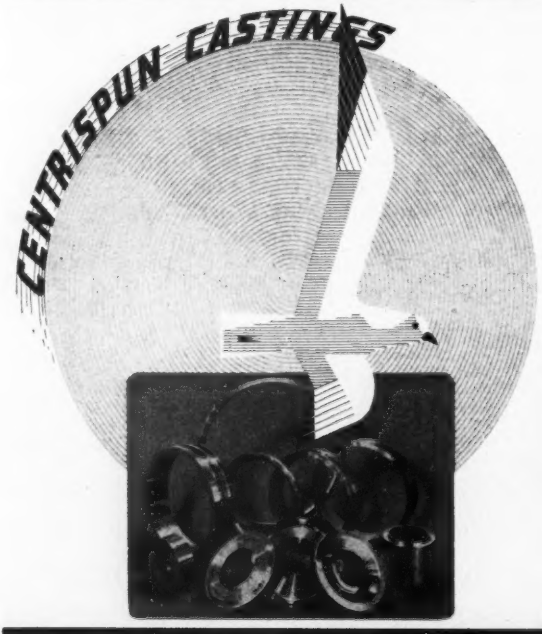

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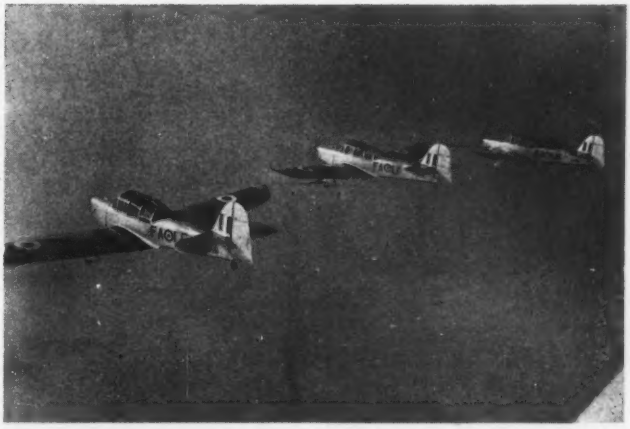

BONDED: These Percival Prentices, flown by F/Ls Urwin, Wood and Sweetman of the Central Flying School detachment at South Cerney were tied together for their displays at several airfields on the R.A.F. "At Home" day (Sept. 15th).

Fifth Sea Lord

AT the end of last month Vice-Admiral E. W. Anstice, C.B., took up his appointment as Fifth Sea Lord and Deputy Chief of the Naval Staff (Air).

An officer of wide experience, the Admiral entered the Navy in 1912 and, as a lieutenant in the 1920's, became qualified as a Fleet Air Arm pilot. He served in both *Furious* and *Courageous*.

At the outbreak of war in 1939 he was serving in the Naval Air Division at the Admiralty, first as Assistant Director and later as Deputy Director.

In 1942, then in the rank of Captain, he went back to sea in command of H.M.S. *Striker*—one of the wartime escort carriers—and in the following year transferred to H.M.S. *Fencer*. By 1945 he held the appointment of Commodore, Flying Training. The Admiral's appointment previous to becoming Fifth Sea Lord was Flag Officer, Flying Training.

R.A.F.A. Helps Jamaica

THE National Council of the Royal Air Forces Association has placed £100 at the disposal of the Kingston (Jamaica) branch to relieve any distress sustained by local members in the recent hurricane. In addition, a subscription list is being opened.

R.A.A.F. Appointments

A NUMBER of appointments in the R.A.A.F. were recently announced by the Minister for Air, Mr. W. McMahon. G/C. W. L. Hely, A.F.C., is to command Western Area (Perth) and G/C. I. D. McLachlan, D.F.C., to command North Eastern Area (Townsville).

G/C. A. G. Carr, A.F.C., is to be the new commanding officer of No. 91 Wing in Japan and G/C. A. D. Charlton, O.B.E., will become Air Commodore Operations.

The new Director of Personal Services at R.A.A.F. H.Q. is G/C. C. T. Hannah, O.B.E., whose place as commanding officer Amberley station will be taken by G/C. W. H. Garing, C.B.E., D.F.C. W/C. I. S. Podger, D.F.C., is appointed Group Training Officer, Point Cook, Victoria.

SALVO: Hawker Sea Furies of the Naval Fighter School make a rocket attack on a splash target towed by the destroyer H.M.S. "Ulster". The occasion was a recent demonstration for senior R.A.F. officers, who were guests of the Royal Navy aboard H.M.S. "Illustrious."

Radio Apprentices' Passing Out

THE passing-out parade and inspection on September 27th marked the successful completion of three years' training by 54 apprentices of the 60th Entry at No. 6 Radio School, Cranwell. These apprentices, who joined the Wing in October, 1948, will now be posted to selected Service units as qualified tradesmen in the trades of air radio fitter and ground radar fitter.

An impressive fanfare, played by the trumpeters of the Band of the R.A.F. College, heralded the arrival on the parade ground of the reviewing officer, Air Marshal A. C. Stevens, C.B. (A.O.C.-in-C., Coastal Command), accompanied by Air Marshal Sir John Whitworth Jones, K.C.B., C.B.E. (A.O.C.-in-C., Technical Training Command), A. Cdre. B. D. Nicholas (A.O.C., No. 27 Group), A. Cdre. L. F. Sinclair, G.C., C.B., C.B.E., D.S.O. (A.O.C., R.A.F. College, Cranwell), and G/C. R. J. P. Morris, C.B.E. (O.C., No. 6 Radio School, Cranwell). Sgt. App. I. D. Wilkinson, the apprentice in charge of the parade, then presented the Entry for inspection.

Before distributing the prizes, G/C. Morris welcomed the reviewing officer and presented the report on the activities and accomplishments of the 60th Entry. He said that during the three long years of technical training, it had been difficult sometimes to see the aircraft for "the little black boxes of radio equipment"; it was a good thing, therefore, to emphasize occasionally the close link that existed between the work at the radio school and its operational application in the R.A.F.

Air Marshal A. C. Stevens presented the prizes as follow: *Technical Subjects* (*Air Radio Fitters*), Cpl. App. A. J. Sargent; (*Ground Radar Fitters*), App. A. J. Feist. *Highest Educational Marks*, Cpl. App. P. H. French; *General Service Subjects*, Sgt. App. I. D. Wilkinson; *Highest Aggregate Marks*, Cpl. App. P. H. French; *Victor Ludorum Trophy*, Sgt. App. I. D. Wilkinson.

The Wing Championship Cup was presented to "A" Squadron and it was also announced that Cpl. App. T. F. Bourne had been awarded a cadetship in the Secretarial Branch.

In his address, Air Marshal Stevens said

SERVICE AVIATION . . .

that the apprentices were entering the R.A.F. at a time when promotion was rapid and that there was no reason why all the Entry should not eventually become commissioned officers or at least senior N.C.O.s.

Laurence Minot Trophy

THE Laurence Minot Bombing Trophy, which has been won for the eighth time by No. 7 Squadron, is to be presented by Marshal of the Royal Air Force Lord Trenchard. The ceremony will take place at R.A.F. Station, Upwood, on October 17th. No. 617 Squadron, the previous holders, were the runners-up this year.

George Medal

FOR his exceptional courage when a Wellington met with an accident last May, L. A/C. G. A. Jarrett of R.A.F. Hullavington has been awarded the George Medal. The citation reads: "In the early hours of May 29th, 1951, a Wellington aircraft crashed and burst into flames about three miles from R.A.F. Station, Hullavington. L. A/C. Jarrett was in charge of the crash crew for that night, as no N.C.O. was available. As driver of the crash rescue jeep, Jarrett was first on the scene of the accident, arriving there in a commendably short time.

"The aircraft was burning fiercely and pyrotechnics and oxygen bottles were exploding. Jarrett saw one of the crew alive in the midst of the wreckage. Without any protective clothing and with only two hand-held fire extinguishers, and showing complete disregard for his own safety, he entered the burning wreckage and extricated this member of the crew, who, unfortunately, succumbed a few minutes later from his injuries. Jarrett then went to the aid of another member of the crew in another area of the burning wreckage and gave assistance until the arrival of the main fire-fighting equipment and ambulance. After this, Jarrett continued to direct fire-fighting operations until the fires had been extinguished.

"Throughout the incident, L. A/C. Jarrett displayed gallantry and devotion to duty of the highest order. He showed great courage and determination in entering the burning aircraft and extricating one member of the crew entirely unassisted, and his courage is further enhanced by his action in again entering the burning wreckage and endeavouring to rescue a second member. He set an excellent example of his determination, initiative, leadership and complete disregard for his personal safety. His thorough understanding and energetic execution of his duties were beyond praise."

NAVAL INSPECTION: Vice-Admiral W. R. Slater, C.B., D.S.O., D.S.C., R.N. meeting the officers of No. 1840 R.N.V.R. Squadron during an inspection of the unit at R.N.A.S. Ford last week.

Naval Air Relief Fund

A NAVAL Air Relief Fund has been formed to provide immediate financial assistance to the widows, and in certain cases dependents, of all Naval personnel wherever they may be serving who lose their lives as a result of accidents directly attributable to Naval Aviation.

The widow of a non-aviation officer or rating killed whilst on duty in an aircraft carrier as a direct result of an aircraft accident would have an equal entitlement to the widow of any aircrew officer or rating who might be killed in the aircraft.

The object of the fund, which does not provide for casualties due to emergency or war operations, is to bridge the gap in time which occurs before recognized Service organizations are able to make enquiries to provide financial relief where necessary and before payments of special allowances or pensions begin.

It is intended that part of the income for this fund shall be provided by setting aside a proportion of the share normally received by Flag Officer Air (Home) from the Navy and Air Days; and, though no individual appeals are to be made to officers or men, it is hoped that regular contributions will be forthcoming from non-public funds of H.M. ships and establishments. The welfare funds of R.N. Air Station, Gosport and the Aircraft Repair Yard, Fleetlands, have already provided generous inaugural subscriptions.

The amount of the assistance—primarily intended to meet immediate financial liabilities—will be £25 and it will be paid immediately without any inquiry as to circumstances. The grant will always be payable to the widow but, in the case of a dependent, only when it is known that he or she was wholly supported by the officer or rating. If the fund flourishes it is hoped to increase the amount of the grants.

STEPPING OUT: A paratrooper, complete with equipment container strapped to his leg, leaves as part of a "stick" from a Hastings at Abingdon, where paratroops are instructed in the art of jumping.

Coastal Exercise

SHORTLY after the air defence exercise "Pinnacle" closes on October 7th, Coastal Command will start exercise "Assess", which is designed to test the defence of convoys. All Coastal Command aircraft will operate in an anti-submarine role, aided by No. 12 Group, Fighter Command.

Reunions

THE fourth annual reunion for W.A.A.F. and W.R.A.F. officers will be in the form of a cocktail party at Londonderry House, London, on November 16th. It is hoped that H.R.H. the Duchess of Gloucester will be present. Tickets (12s. 6d.) from Miss P. Bruzaud, O.B.E., Highfield End, West Byfleet, Surrey.

The annual reunion of No. 208 (Naval Eight) Squadron is to be held in London on November 10th. S/L. B. Champneys, D.F.C., R.A.F., West Raynham, near Fakenham, Norfolk, is the organizer.

For particulars of No. 612 Squadron's reunion, which will also be held in London on November 10th, members are asked to write to W. N. Parsons, 24 Whitehall Gardens, London, W.3.

October 20th is the date fixed for the annual reunion of No. 166 Squadron and R.A.F. Kirmington. Mr. F. C. Tighe, 31 Mayo Road, Sherwood Rise, Nottingham, has the details of time and place.

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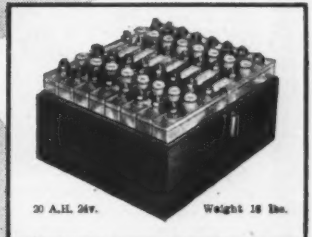

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Farmborough Fare

Printers have been blamed for many errors in a world that lives on ink but this substitution of an M for an N (a small matter in compositors' parlance) is none of their doing. Perhaps the caravan site and frequent loud speaker invitations to visit it transformed the Plain to pedigree pasturage. Maybe the sight of a Land Rover tucked away in a corner of the Blackburn Universal barn had something to do with the mix-up. That other cattle comfort, the Bristol Freighter, fresh from 'Operation Air Beef' and mountain top dressing, no doubt added to the illusion as did talk about feeder lines, Pest Control Percivals and agricultural Austers.

The legend that only docile, pale faced cattle come from Hereford dies hard and it was perhaps excusable if some who had heard of Saunders Valves for Dairies thought the 4 in. Spherical Plug model was designed to speed up milk production.

We hope however that visitors to Stand 165 went away quite satisfied that a Rooster Booster competitor of the Snarler was not in production and that certain valves exhibited on the stand were not intended to replace those polite SHUT THIS GATE notices beloved of farmers.

But after all it was encouraging to meet, at the Cockpit, every one of the Industry's Technicians who had resolved for T Day to be a Farmborough Boy-oy-oy-oy.

1067 and all That!

Time has flown a long way since Duke William touched down at Pevensey in that most memorable year of this island's history but, it seems, that Duke (Neville) will travel quite a lot farther in fewer years if he remains airborne in that Hawker 1067. Surely the authors of '1066 and all That' would agree that this 'finest fighting aircraft in the world' is at least a good thing for this corner of the hemisphere.

But of the good things contributing to this phenominal aircraft's success we must await the lifting of the strictures of the secret list. It is not out of place, however, to mention the incorporation of Saunders Aero Cocks in such notable Hawker precursors as Tempests, Sea Hawks, 1052's and 1081's.

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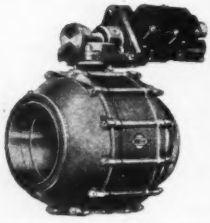

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3 in. cl.	5.88 in.	10.85 in.	8.27
4 in. cl.	11.11 in.	6.94 in.	13.00

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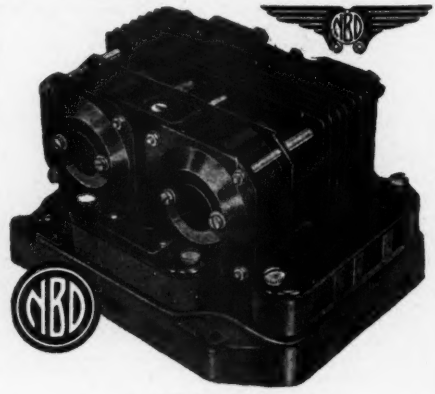

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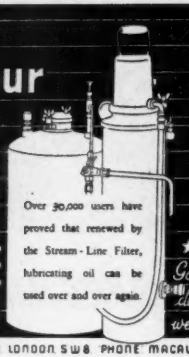

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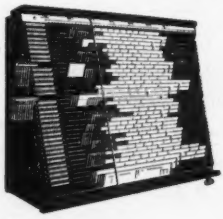

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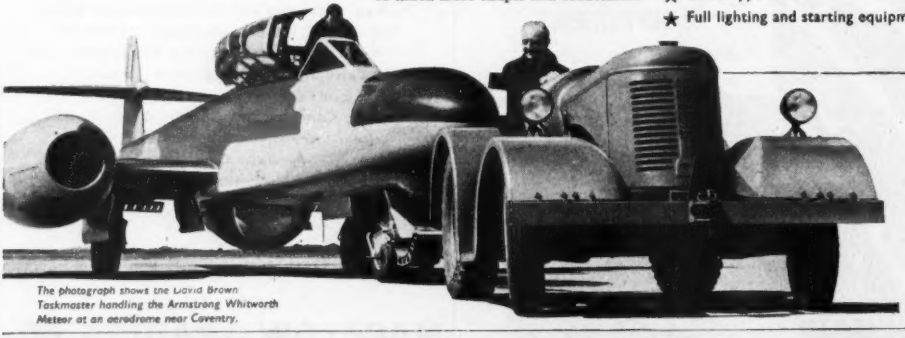

The photograph shows the David Brown Taskmaster handling the Armstrong Whitworth Meteor at an aerodrome near Coventry.

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(b) Flight Navigator's Licence. Service or civilian equivalent considered provided licence is obtained within one year.

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AIR navigation instructor, based London, good appointment, excellent prospects. Flight navigator qualification or equivalent experience.—Box 4342. [0280

LICENSED aircraft radio engineer required immediately. —Apply to Chief Engineer, Eagle Aviation, Luton Airport, Beds. [0611

SITUATIONS VACANT

HANDLEY PAGE, Ltd., have vacancies for:

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WIND tunnel technicians with 1st or 2nd class Hons. degree and with experience in or preference for wind tunnel work.

JUNIOR stressmen of degree standard. Experience preferred but not essential.

SENIOR design and intermediate draughtsmen, preferably with aircraft experience, for their Cricklewood and Radlett offices. Consideration will be given to applicants with experience in light structural or mechanical engineering. Possession of O.N.C. or H.N.C. (mech. or elect.) an advantage.

LOFTSMEN with previous experience in full-scale layout work or similar workshop practice. These vacancies are at Cricklewood only.

APPLICATIONS, stating age, qualifications and details of experience, to: Staff Officer, Handley Page, Ltd., Cricklewood, London, N.W.2. [6793

WEIGHTS engineer required. Varied, interesting, work. —Portsmouth Aviation Developments, The Airport, Portsmouth. [7009

AIR traffic controller required by Universal Flying Services, Ltd., Fair Oaks Aerodrome, Chobham, Surrey. Tel.: Chobham 375.—Apply, Secretary. [6985

BROOKLANDS AVIATION, Ltd., have vacancies for airframe and engine fitters, electricians for servicing and repair of R.A.F. aircraft. Good wages and piecework bonus.

APPLY: No. 4 Site, Sywell, Northants. [6998

OLLEY AIR SERVICE have vacancies for pilots with current senior commercial and instrument rating. Commencing salary £1,200 with increments.

VACANCIES exist for licenced aircraft radio maintenance and electrical engineers.—Apply: Croydon Airport. [7027

NORMALAIR, Ltd., Yeovil, invite applications from the following, for work in connection with aircraft air conditioning, pressurizing and high altitude breathing equipment:—

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TECHNICAL ASSISTANTS.

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STRESSMEN.

TECHNICAL ILLUSTRATORS.

APPLICATIONS to the Personnel Officer, Normalair, Ltd., Yeovil, Somerset, must state age, experience, qualifications and salary required. Where convenient selected applicants will be interviewed in towns near their address. [7030

SENIOR draughtsmen required with mechanical experience, preferably in the aeronautical sphere, for company in south-west England.—Box No. 4371. [7024

FEMALE assessor for analysis of photographic test records to take charge of a small computing team about to be formed.—Apply: Personnel Manager, Folland Aircraft, Ltd., Hamble, Southampton. [7028

JIG and tool draughtsman required, fully experienced. —Applications, in writing, to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Beds, stating age, experience and salary required. [6593

WANTED, flight engineers for York aircraft. "A" and "C" to cover York aircraft essential.—Apply: Chief Engineer, Eagle Aviation, Ltd., Luton Airport, Luton, Beds. [6810

TECHNICAL assistant required by a firm in Kent. Aircraft experience essential and preferably some knowledge of aerodynamics. Living accommodation available. —Box 4200. [6973

LINK trainer instructor required for basic pilot training. Applicants should preferably hold an R.A.F. Category. —Apply, Chief Instructor, Airwork, Ltd., R.A.F. Station, Booker, nr. Marlow, Bucks. [6892

VICKERS-ARMSTRONGS, Ltd. (Aircraft Section) are shortly opening a jig and tool drawing office at Hurn Airport and will be requiring senior jig and tool draughtsmen (aircraft experience preferable).

APPLICATIONS should be made in writing to the Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge Works, Weybridge, Surrey. [6986

TECHNICAL assistants with engineering apprenticeship training and Higher National Certificates, preferably with some experience on combustion and fuel metering work required on new project.

APPLY, giving full particulars of age, experience, salary required, etc., and quoting ref. B.10, to Box 4267. [7005

CHIEF jig and tool designer with experience in production development engineering for complete aircraft. Apply in first instance with particulars of qualifications, experience, age, and salary required, to Box 4094. [6960

RESIDENT lady secretary-book-keeper, age 25-30. Shorthand typing. Double entry essential. Board, accommodation plus £312.—Yorkshire Aeroplane Club, Sherburn-in-Elmet, Yorkshire. [6966

JIG and tool draughtsmen required. Previous aircraft experience not essential. Pension and life assurance scheme.—Apply: Employment Manager, Vickers-Armstrongs (Aircraft Section), Weybridge. [6806

APPLICATIONS are invited from design draughtsmen and stressmen; also technical assistants with combined design and performance experience for work on both reciprocating and gas turbine aero engines.

APPLICATIONS should state full particulars of experience and qualifications and should be addressed to The Personnel Manager, The de Havilland Engine Co., Ltd., Stonegrove, Edgware, Middx. [6975

SCHEDULE clerks required (male) with experience in compiling M.o.S. spares schedules.—Applications, in writing, stating age, experience and salary required, to Personnel Manager, Percival Aircraft, Ltd., The Airport, Luton, Beds. [6996

AIR SCHOOLS, Ltd., require two ground instructors for basic and reserve schools at Derby. Ex-flying instructors suitable or ex-R.A.F. pilots having an instructional background. Good conditions of employment with superannuation scheme.

A navigator required, a suitably qualified navigation instructor for flying duties, and a Link Trainer instructor.

APPLICATIONS to Air Schools, Ltd., Municipal Airport, A Burnaston, nr. Derby. [7007

TECHNICAL authors and illustrators required. Knowledge of M.o.S. procedure desirable.—Applications in writing, stating age, experience and salary required, to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Beds. [6994

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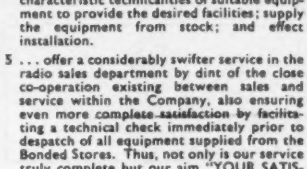

SITUATIONS VACANT

TECHNICAL assistants wanted for work on supersonic aerodynamics. Higher National or Inter B.Sc. standard.—Write full details, qualifications, experience, age, salary sought, to Box AC6004, Samson Clarke, 57-61, Mortimer Street, W.1. [6993

LIAISON engineer experienced in aircraft sheet metal work. Production and development. Good opportunities.—Write, stating experience, salary required, when available, The Secretary, Delaney Gallay, Ltd., Edgware Road, N.W.2. [6991

MECHANICAL, structural or general engineering draughtsmen wanted for aircraft work. Previous aircraft experience not essential. Pension and life assurance scheme.—Apply, Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge. [6990

URGENTLY required for high-class precision work, instrument fitters, assembly fitters used to fine limits, universal millers and capstan setter operators.—Apply, giving full details of experience, etc., to Personnel Officer, Normalair Ltd., Yeovil, Somerset. [6963

PLANNING engineers for gas turbine assembly and test required. Good salaries and prospects for suitable applicants. 5-day 39-hour week. Superannuation scheme. —Apply, giving details of previous experience and salary required, to Box 3917. [6909

ASSOCIATION working in specialised field of aviation requires competent secretary-shorthand-typist. Initiative and ability to run office under limited supervision essential. Experience of aviation world desirable. Salary according to qualifications.—Apply Box 4346. [7019

RATEFIXER required for detail fitting shop. Must have had previous aircraft experience.—Write, stating age and qualifications, to the Personnel Manager, de Havilland Aircraft Company Limited, Airspeed Division, The Airport, Portsmouth. [7029

H. M. HOBSON, Ltd., invite applications for positions in the drawing office as follows: designers, detail and modification draughtsmen, checkers, stressmen. The work is concerned with interesting projects connected with fuel metering equipment and hydraulic flying controls for aircraft.—Hobson Works, Fordhouses, Wolverhampton. [6930

CHIEF stressman. A vacancy exists at the head of the stress office of The Heston Aircraft Co., Ltd., Heston Airport, Hounslow, Middlesex.—Applications are invited to chief designer and should clearly outline academic qualifications and technical experience. Salary required should be stated. [7003

PLANNING engineers for interesting experimental work. Will be required to work on own initiative, knowledge of other machine tools or airframe detail and assembly. Higher National Certificate preferred but not essential.—Apply, with full particulars, quoting ref. D.6, to Box 4296. [7006

DEVELOPMENT Engineers for electronic and electrical instruments required. High priority work. Location South Wales. Pension scheme. Salary £500 to £700 per annum. Technical qualifications and industrial experience to Box 191, C. R. C., 29, Hertford Street, London W.1. [7017

THE Supermarine Works of Vickers-Armstrongs, Ltd., have vacancies for mechanical and structural engineering draughtsmen with aircraft experience preferred but not essential.—Write, giving full details of experience and salary required, to Personnel Officer, Vickers-Armstrongs, Ltd., Hursley Park, nr. Winchester. [6998

ONE technical writer and one technical artist for small technical publications section being formed. Previous experience on similar type of work on aircraft or aircraft engines desirable with good engineering background.—Apply, giving details of age, experience and salary required, etc., to Box 4233, quoting ref. B.9. [6997

APPLICATIONS are invited from senior and intermediate design draughtsmen; experience of aero engine design desirable but not essential.—Please write, stating age and giving details of previous experience in chronological order, to the Personnel Officer, The de Havilland Engine Co., Ltd., Stonegrove, Edgware, Middlesex. [7040

AIRCRAFT fitter assemblers required by de Havilland Aircraft Co., Hatfield, offering good working conditions, modern equipments, opportunities for advancement, Superannuation scheme, sports club, etc.—Apply by telephone: Hatfield 2345, in person, or by letter addressed to Personnel Manager. [6930

DRAUGHTSMEN. Vacancies exist for two section leader draughtsmen with experience in airframe design, for work on new and interesting projects, those experienced in design of gas valves for use at low temperature would be desirable but not essential. Midland area.—Box 4153. [6967

ENGLISH ELECTRIC have vacancies in their London design office for aircraft stressmen. Suitably qualified men, having structural stressing experience, should write giving full details and quoting ref. 806A, to Central Personnel Services, the English Electric Co., Ltd., 24-30, Gillingham Street, London, S.W.1. [6964

ENGLISH ELECTRIC invites applications from suitably experienced draughtsmen for aircraft work at Warton or in London. Men interested in these permanent positions should write, quoting ref. 120F, to Central Personnel Services, English Electric Co., Ltd., 24-30, Gillingham Street, London, S.W.1. [6963

PLANNING engineers (aircraft) required. Considerable production planning experience and sound knowledge of metal airframe components manufacture essential.—Applications, in writing, to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Beds, stating age, experience and salary required. [6933

THERE are still some vacancies for senior aerodynamicists, and senior and junior stressmen in the Saunders-Roe design organization.—Men of suitable ability and qualifications are invited to apply, stating experience, qualifications, age and salary expected, to the Personnel Officer, East Cowes, I.O.W. [6997

TECHNICAL assistants required, experience of aero engine development testing and reporting an advantage. 5-day week, good canteen facilities.—Please write, giving age and full details of previous experience, to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [6926

DRAUGHTSMEN with experience in high-quality light mechanical or hydraulic engineering are required by progressive Midland manufacturing company. Positions with good prospects are available to younger men. Salaries will be in accordance with age, qualifications and experience.—State details, together with salary required, to Box 4095. [6956

ROCKET propulsion. Two senior draughtsmen required on structural design, one on installation design and one on propulsion design, for new and interesting work. Higher Certificate desirable, coupled with previous experience of similar nature on aircraft engine design. Also several detail draughtsmen required for each of the above sections.

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APPLY, giving details of age, experience and salary required, quoting ref. C.2, to Box 4236. [7004

SITUATIONS VACANT

BLACKBURN AND GENERAL AIRCRAFT, Ltd., have vacancies for assistants in their instrument laboratory for instrument calibration and repair work. Experience of this class of work and of R.A.F. instruments is desirable although not essential.—Applications, giving particulars of age, training, experience, etc., to the Personnel Manager, Brough, E. Yorks. [6925

AIR FORCE. Naval, civil and helicopter aircraft all under design and development at Percival Aircraft, Ltd. Applications are invited from senior and junior draughtsmen, and stressmen, for work on this interesting programme.—Write, giving details of experience and salary required, to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Luton, Beds. [6956

METALLURGIST required with experience in metallography for propeller laboratory. Applicants should be Licentiate Members of the Institution of Metallurgists or should possess equivalent qualifications. Salary according to age, qualifications and experience.—Write full details, qualifications, experience, age, salary sought, to Box AC6008, Samson Clarke, 57-61, Mortimer Street, W.1. [6894

HANDLEY PAGE, Ltd., have vacancies for senior and junior technical assistants in their mechanical and structural test departments at Cricklewood and Radlett. Qualifications should include a degree or Higher National Certificate. Previous experience is desirable but not essential.—Write, stating age, qualifications and details of experience, to Staff Officer, Handley Page, Ltd., Cricklewood, London, N.W.2. [6738

A PROJECT engineer is required by a well-known firm of instrument makers to direct the work of a section responsible for the layout and installation of specialized electronic equipment in aircraft. Applicants should be qualified electrical engineers, having experience in, and with enthusiasm for, this kind of work. They are asked to send full particulars of experience and training, stating salary required and quoting Ref. PE to Box 4279. [6980

SENIOR planning engineers wanted. Applicants must have served an apprenticeship and have had experience with component breakdown and detail processing as planning engineers. The company operates a national annuation and life assurance scheme.—Applications in writing, stating age, experience and salary required, should be addressed to the Personnel Manager, Folland Aircraft, Ltd., Hamble, Southampton. [6956

APPLICATIONS are invited for the responsible position of flight engineer for guided missiles. Applicant should be of degree standard and have practical experience of mechanical and electrical installations. Knowledge of telemetry and servo mechanisms is desirable, though not essential. North London district.—Write full details, qualifications, experience, age, salary sought, to Box A.C.65800, Samson Clarke, 57-61, Mortimer Street, W.1. [6930

THE DE HAVILLAND AIRCRAFT Co., Ltd., invites applications for vacancies in the stress department of their Christchurch branch. Applicants should have a minimum of four years' experience in stress analysis of aircraft structures.—Apply, stating age, experience, and salary required, to Chief Structural Engineer (Aircraft). The de Havilland Aircraft Co., Ltd., Hatfield Aerodrome, Herts. [7029

ENGINEERS IL required by Ministry of Supply in London. Qualifications: British, of British parentage; regular engineering apprenticeship and either be corporate members of one of the Institutions of Civil, Mechanical or Electrical Engineers or Associate Fellow Royal Aeronautical Society, or have exempting qualifications. In addition, for Post I, production experience in aircraft factories and be interested in the planning and statistical aspects of production management; for Posts II and III, wide knowledge of the construction and manufacture of aircraft, engines and equipment; and be familiar with the methods employed to secure satisfactory interchangeability and inspection standards, or of jigging and tooling employed. Duties: Post I—The analysis of the productive and repair capacity of aircraft contractors; preparation of extension and emergency programmes; assessment of labour force, floor space and airfield requirements; statistical analysis of production data. Post II—Co-ordination of gauge requirements and investigation of gauge manufacturing capacity and problems connected with the production of jigs, fixtures, gauges and measuring instruments required for interchangeability. Post III—Co-ordination of jig and tool requirements and investigation into manufacturing capacity and sub-contracting facilities for jigs and tool making. Salary: £900 to £1,300 per annum. Unestablished, periodical competitions for establishment. Application forms from Ministry of Labour and National Service, Technical and Scientific Register (K), York House, Kingsway, W.C.2. Quoting Ref. C.565/51A. Closing date October 20th, 1951. [7016

SITUATIONS VACANT

A WELL-KNOWN North London aeroplane firm requires young technicians for development work on hydraulic, pneumatic components. Applicants should have A.M.I.Mech.E. or a degree and have had some practical experience. The work is of national importance and interesting. Good salaries are available to suitable applicants.—Write full details, qualifications, experience, age, salary sought, to Box AC65996, Samson Clarks, 57-61, Mortimer Street, W.1. [6931

SERVICE engineers, experienced, required. Good knowledge of all maintenance and overhaul of gas turbine engines essential. Opportunities of overseas travel exist for applicants having required technical background, education and experience. Also required, technical assistants, aged 26 and upwards, for Service Department duties. Must be able to deal with correspondence, compile technical records, etc., without supervision.—Apply, the Personnel Officer, the de Havilland Engine Co., Ltd., Leavesden Aerodrome, nr. Watford, Herts. [6976

SENIOR technician (female) required to take charge of small computing section operating electrical calculators, carrying out calculations for an aircraft design technical office. Applicants should have a knowledge of applied mathematics to at least engineering degree standard and ability to supervise. Salary according to experience and qualifications.—Applications should be addressed to: The Personnel Manager, the Bristol Aeroplane Co., Ltd. (Aircraft Division), Filton House, Bristol. [6911

NORMALAIR, Ltd., invite applications from designers and draughtsmen for work in their London office, in connection with aircraft air conditioning, pressurising and high-altitude breathing equipment. Experience of aircraft equipment or delicate precision mechanisms is essential, only first-class qualified men will be considered. —Applications, stating age, experience, qualifications, and salary required should, in the first instance, be addressed to the Personnel Officer, Normalair, Ltd., Yeovil, Somerset. [6954

AIRCRAFT instrument repairers are required by New Zealand National Airways Corporation for service in New Zealand. Applicants must have good experience in the aircraft industry on modern aircraft. Only single men wishing to emigrate to New Zealand should apply. Free passage and accommodation on arrival are provided. Applications, giving full details of training, experience and qualifications, should be addressed to Chief Personnel Officer, B.O.A.C., Airways House, Great West Road, Brentford, Middlesex, to reach him not later than October 17th. [7022

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THE Supermarine Works of Vickers-Armstrongs, Ltd., have vacancies for draughtsmen for component and installation work on radio, electrical, electronic and instrument installations in aircraft. Practical and D.O. experience desirable but not essential.—Write, giving full details of experience and salary required, to Personnel Officer, Vickers-Armstrongs, Ltd., Hursley Park, nr. Winchester. [6986

SENIOR design draughtsmen and detail draughtsmen required to assist in the conversion of aircraft for a wide variety of experimental work and other defence projects of advanced interest. Only keen intelligent men with a flexible outlook on experimental design work need apply. Preference will be given to candidate with ordinary or Higher Nat. Cert. qualifications. Location, Bedfordshire.—Write, stating experience, qualifications, age and salary required, to Box 4234, quoting ref. A.12. [6988

JIG and tool draughtsman required for aircraft and automobile accessory work. Good technical training essential combined with thorough practical experience in toolroom, production shops and in jig and tool drawing office. Excellent opportunity for young man of ability. Assistance given in obtaining accommodation.—Write, stating age, qualifications, experience and salary, to Personnel Officer, Lockheed Hydraulic Brake Co., Ltd., Leamington Spa. [6955

A YOUNG mechanical engineer is required by the Water Turbine Design Dept. of the English Electric Co. at Rugby for work on the design of hydraulic servo-mechanisms. Previous design experience on hydraulic servo-mechanisms in the aircraft or automobile industry would be acceptable for this extremely interesting class of work. Please apply, giving full details and quoting ref. 917 to Central Personnel Services, The English Electric Co., Ltd., 24-30, Gillingham Street, London, S.W.1. [7010

THE Supermarine Works of Vickers-Armstrongs, Ltd., have vacancies in their Publications Department in connection with the preparation of aircraft-instruction manuals. Applicants should have experience in either of the following groups: (i) Perspective Drawing and Workshop Drawing; (ii) Writing articles of a Technical nature; (iii) Assistant Librarian for Air Ministry Publications (R.A.F. maintenance experience an advantage).—Write, giving full details of experience and salary required, to Personnel Officer, Vickers-Armstrongs, Ltd., Hursley Park, nr. Winchester. [6984

BRITISH EUROPEAN AIRWAYS have vacancies for pilots, with at least a commercial pilot's licence, (a) Pilots aged under 25 for a normal engagement which includes membership of the pension scheme. Commencing salary between £815-£935 p.a., according to qualifications and experience. (b) Pilots aged 35 and over for a temporary appointment of two years, with the possibility of extension. Commencing salary between £815-£1,305 p.a., according to qualifications and experience. Such pilots will not be eligible for the pension scheme, but will receive a gratuity of £300 for each year of service on expiry of appointment.—Requests for application form by postcard to Personnel Officer, Flight Operations Department, B.E.A., Ruislip, Middlesex. [6900

MATHEMATICIANS are invited by the Ministry of Supply to apply for appointment in the Scientific Officer class at an Experimental Establishment near Salisbury, for the study of theoretical problems of stability and control, and the application of statistics to aircraft testing requirements. Candidates should have a 1st or 2nd class honours degree in Mathematics or equivalent qualification. A sound basic knowledge of aerodynamics is essential and experience in the analysis of experimental results is also desirable. For the senior grade candidates must be at least 26 years of age with a minimum of three years post-graduate research experience. Salary will be determined on age, qualifications and experience, within the ranges: Senior Scientific Officer, £720 to £910; Scientific Officer, £360 to £620. Rates for women somewhat lower. Posts are unestablished but carry benefits under F.S.S.U. Application forms obtainable from Ministry of Labour and National Service, Technical and Scientific Register (K), York House, Kingsway, London, W.C.2, quoting A 273/51/A. [7015

SITUATIONS WANTED

COMMERCIAL pilot, 37, and aircraft engineer; 20 years' experience aviation, seeks position with private owner or company where experience would be usefully employed. Box 4375. [7002

DESIGNER-DRAUGHTSMAN desires spare-time work. 20 years' experience gear transmissions, turbines, blowers, hydraulics, electrical machinery.—J. Romer, 26, Fernshaw Road, London, S.W.10. [7001

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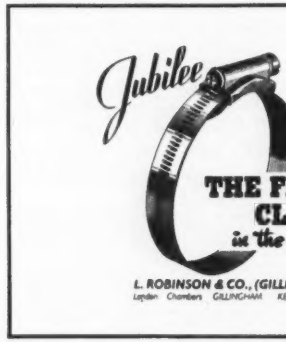

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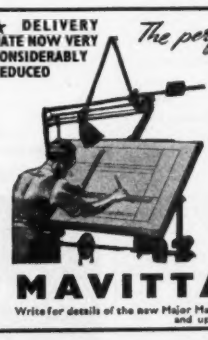

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